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AMERICAN MACHINIST

A JOURNAL FOR MACHINISTS, ENGINEERS, FOUNDERS, BOILER MAKERS, PATTERN MAKERS AND BLACKSMITHS.

VOL 11, No. 38. WEEKLY. | NEW YORK, SEPTEMBER 22, 1888. | $2.50 per Annum. SINGLE COPIES 5 CENTS.

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A New Lathe Chuck.

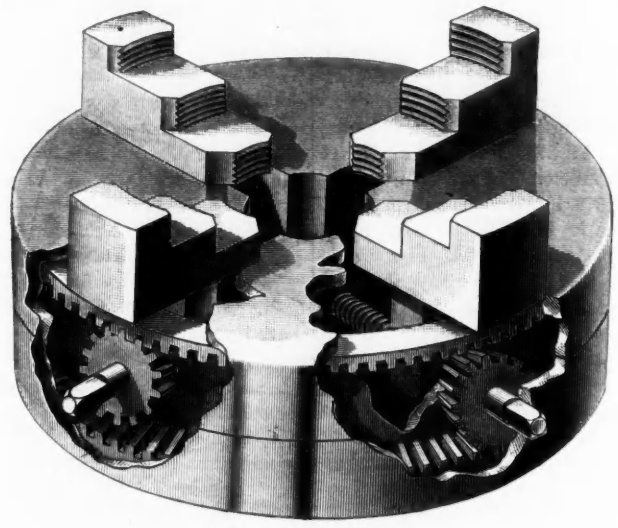
It is a fact familiar to machinists that universal chucks, having four jaws, all moving together by the same rack or scroll, are of little use, comparatively, because the jaws being presumably ground true, the distance from the gripping face of every jaw to the corresponding face of the opposite jaw is at all times equal to the corresponding distance between the other pair of jaws. This fact prevents more than one pair of jaws coming in contact with the work, unless it is turned or otherwise made true before being chucked; or, if the work is not cylindrical, it must have at least two dimensions equal to each other, and these dimensions must be so disposed that the chuck jaws can be made to bear at points corresponding to them. For instance, if a gear blank, or other piece of work which has been cast or forged to an approximately round shape of, say, 12 inches diameter, is to be chucked, when one pair of jaws comes in contact with the piece the other pair can be closed no further, and if the work happens to be a sixteenth of an inch or more larger one way than the other (which oftener happens than not with rough work), only one pair of jaws can come in contact, and the efficiency of the chuck is reduced to an equality with that of a two-jawed chuck, the work failing to be centered, except in one direction, and being also very insecurely held.

So it is with any piece of work which is not at least as true as the jaws of the chuck are.

It is for this reason that nearly all universal and combination chucks have only three jaws, since all the jaws of such a chuck must come to a bearing, and make the work true at three points, regardless of its shape.

But work which is made true at four points is centered better than if made true at only three points, and every one who has an opportunity to compare the holding power of independent four-jawed chucks with that of independent three-jawed chucks, has found that the former will hold work much the most securely.

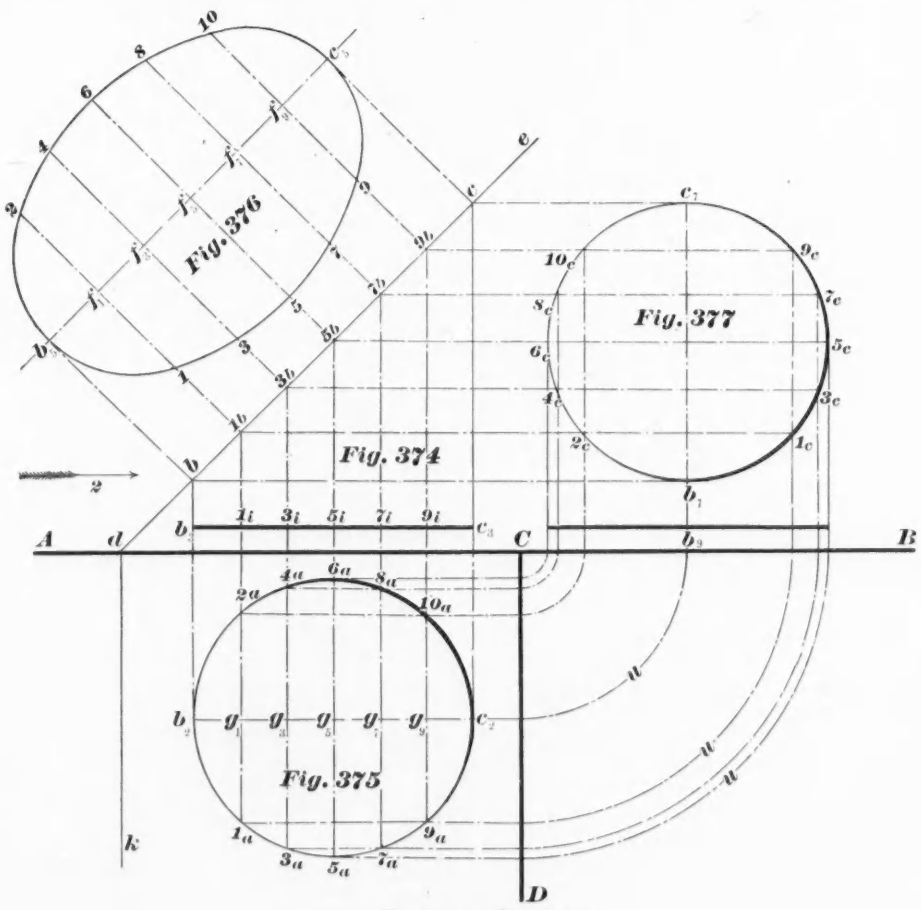
The object of the chuck which we illustrate herewith, is to provide a universal chuck having four jaws, so arranged that all of them will come into contact with, and do their full duty in holding the work regardless of its shape. The chuck is in construction much the same as the ordinary universal or combination chuck, but instead of having one annular rack by which all the pinions and screws are driven, it has two such racks, one of them being in the back part of the shell behind the pinions and the other in the front part of the shell in front of the pinions. The two pinions for one pair of jaws engage with one of these racks, the remaining pair with the other, and thus, when a piece of work is chucked, by applying the wrench to one screw, the corresponding pair of jaws are brought up to the work and center it one way, after which the other pair are brought up and center it the other way, no matter what the difference in size of the two dimensions may be, so long as it is within the limits of the capacity of the chuck. By this arrangement, work which is round, oval, square, hexagonal, octagonal, oblong, or in almost any form met with in ordinary machine shop practice can be accurately centered and securely held. Of course after the jaws are brought to a bearing on the work, they are tightened by going around the chuck from one screw to another, with the wrench, in the same manner as with an ordinary chuck.



NEW LATHE CHUCK.

It will be seen that a chuck constructed in this way will have advantages peculiarly its own, that it will center pieces of almost any shape met with in ordinary practice, and, having centered them, will hold them with the firmness and rigidity of any four-jawed chuck. The inventor is Mr. F. H. Van Houten, Matteawan, Dutchess County, N. Y.

The Southern cotton growers are justly indignant over the effort of the bagging trust to put up the price of cotton bagging beyond reason, just as it must be had for the cotton crop. But their indignation is likely to do them no good, for the present. There appears to be no law that can operate to restrain the modern trust in this country, no matter to what extremes it may go. But we have faith to believe that its power will be curtailed in the near future. It is hardly probable that the people will consent to be shorn indefinitely for the benefit of a few individuals.



PRACTICAL DRAWING.

Practical Drawing.

BY J. G. A. MEYER.

FIFTY-NINTH PAPER.

Problem 73.

489. *To find the intersection of a plane with a cylindrical surface.*

Let the line $d\,e$, in Fig. 374, represent the cutting plane standing perpendicular to the vertical plane of projection, and passed through a right cylinder with a circular base; let $b\,b_3\,c\,c_3$ be the vertical projections of a portion of such a cylinder whose cylindrical surface above the base $b_3\,c_3$ terminates in the given intersecting plane $d\,e$; the axis of the cylinder is perpendicular to the horizontal plane of projection. It is required to find the true form of the curve of intersection. Under these conditions the circle $b_2\,c_2\,5a\,6a$, in Fig. 375, will be the horizontal projection of that portion of the cylinder whose vertical projection is represented in Fig. 374 by the outline $b\,b_3\,c\,c_3$.

Fig. 375. Draw the diameter $b_2\,c_2$ parallel to the ground line $A\,B$, and divide it into any number of equal parts, say six. Through the points of division g_1, g_3, g_5, g_7 and g_9 draw vertical lines, each line cutting the circumference in two points; for instance, the vertical line through g_1 will cut the circumference in the points $1a$ and $2a$; the vertical line through g_3 will cut the circumference in the points $3a$ and $4a$, and so on. Prolong these vertical lines upwards so as to cut the line $b\,c$ (Fig. 374) in the points $1b$, $3b$, $5b$, $7b$, and $9b$. At any convenient distance away from the line $b\,c$ draw the line $b_5\,c_5$ parallel to $b\,c$. Through the points b, $1b$, $3b$, $5b$, $7b$, $9b$ and c draw lines perpendicular to $b\,c$; let these perpendicular lines extend a little beyond the line $b_5\,c_5$, and cutting the latter line in the points b_5, f_1, f_3, f_5, etc. The quickest way to draw these perpendicular lines will be with the aid of the T and set square, in a manner as illustrated in Fig. 71 and described in Art. 107. If these perpendicular lines are correctly drawn, as they should be, the length of the line $b_5\,c_5$ will be equal to the length of the line $b\,c$; and the distances between the points b_5, f_1, f_3, etc., will be equal to the distances between the points b, $1b$, $3b$, etc. From the point f_1 as a center, and with a radius equal to $g_1\,2a$ or $g_1\,1a$ (these distances being equal to each other) describe two short arcs cutting the perpendicular through $1b$ in the points 1 and 2; again, from the point f_3 as a center, and with a radius equal to $g_3\,4a$, describe two short arcs cutting the perpendicular through $3b$ in the points 3 and 4. In a similar manner lay off the points 5 and 6; 7 and 8; 9 and 10; making the distance between 5 and 6 equal to $5a\,6a$; between 7 and 8 equal to $7a\,8a$; and between 9 and 10 equal to $9a\,10a$. Join the points b_5, 2, 4, 6, 8, 10, c_5, 9, 7, 5, 3, 1 by a curve; this curve will be the required curve of intersection.

The curve, if correctly drawn, will be a true ellipse; the line $b_5\,c_5$ will be the major axis; and the line 6 to 5 the minor axis. (Art. 376.)

490. Now, let us examine the principles upon which this construction is based.

In the first place, let us consider the surfaces which can be seen in Fig. 375. We know that Fig. 375 represents the horizontal projection of that part of the cylinder which lies below the intersecting plane *d e*, shown in Fig. 374. Consequently we may say that the circle b_2 c_2 5*a* 6*a* (Fig. 375) represents the horizontal projection of the base of the cylinder; the same circle also represents the upper or slanting face of the cylinder; this face is represented in Fig. 374 by the line *b c*. Indeed, the surface which is exposed to view in Fig. 375 is the slanting or upper face of the cylinder. But this upper face lies in the intersecting plane; or, we may say, is part of this plane. The intersecting plane cuts the cylindrical surface in a curve, and the horizontal projection of this curve is the circumference of the circle b_2 c_2 5*a* 6*a*; the true form of this curve is to be found. If the intersecting plane had been perpendicular to the axis of the cylinder, then the true form of the curve of intersection would be the circumference of the circle b_2 c_2 5*a* 6*a*, and a construction such as shown here would not be necessary.

The intersecting plane is perpendicular to the vertical plane of projection and inclined towards the horizontal plane of projection, therefore, as will be presently seen, the circumference b_2 c_2 5*a* 6*a* shows the correct width of the curve of intersection in the directions of the lines 1*a* 2*a*, 3*a* 4*a*, etc., but does not show the correct length of the curve in the direction of the line b_2 c_2. That this circumference shows the correct width of the curve of intersection can be proved as follows:

The line *d e*, in Fig. 374, is the vertical trace of the given intersecting plane, and since this plane is perpendicular to the vertical plane of projection, its horizontal trace must be the line *d k* drawn perpendicular to the ground line *A B* (see Art. 320 and Fig. 231). Now all lines drawn parallel to the horizontal trace *d k* must be parallel to the horizontal plane of projection, and therefore, according to Art. 242, the correct lengths of such lines can be seen. Assume that the lines 1*a* 2*a*, 3*a* 4*a*, etc., are lines drawn on the upper or slanting surface of the cylinder. Now the lines 1*a* 2*a*, 3*a* 4*a*, etc., are parallel to the trace *d k*, because we have drawn them perpendicular to the diameter b_2 c_2, which is parallel to the ground line *A B*. The lengths of the lines 1*a* 2*a*, 3*a* 4*a*, etc., are limited by the circumference b_2 c_2 5*a* 6*a*, and therefore the extremities of these lines are points in the curve of intersection. But since the lines 1*a* 2*a*, 3*a* 4*a*, etc., are parallel to the trace *d k*, we see their correct length; therefore the line 1*a* 2*a* shows the correct distance between points 1*a* and 2*a* in the curve of intersection; and the line 3*a* 4*a* shows the correct distance between the points 3*a* and 4*a*; similar remarks apply to the other points in the curve.

The diameter b_2 c_2 is the horizontal projection of the major axis of the curve of intersection. But because this line b_2 c_2 lies on a slanting surface we cannot see its correct length; and for a similar reason we cannot see the correct distance between the points b_2 and g_1; or that between the points g_1 and g_2, etc.

In Fig. 374 the line *b c* is the vertical projection of the same major axis, and here we see its correct length, and therefore the distances between the points b_5, 1*b*, 3*b*, etc., are the correct distances between the points b_2, g_1, g_2, etc., shown in Fig. 375.

Now in order to find the true form of the curve of intersection, we have only to combine the true length of the curve as given in Fig. 374, with the true width of the curve at certain intervals as given in Fig. 375; and this is precisely what we have done in Fig. 376. In the latter figure, the length of the line b_5 c_5 is equal to the length of the line *b c*, shown in Fig. 374; and the distances between the points b_5, f_1, f_2, etc., Fig. 376, are equal to the distance between the points *b*, 1*b*, 3*b*, etc., shown in Fig. 374. And lastly, the distances between the points 1 and 2, 3 and 4, 5 and 6, etc., are equal to the distances between the points 1*a*, 2*a*; 3*a*, 4*a*; 5*a*, 6*a*, etc., as shown in Fig. 375. Therefore the curve drawn through the points b_5, 1, 3, 5, etc., will be the true form of the curve of intersection.

The foregoing remarks constitute a practical demonstration of the correctness of our construction.

491. In descriptive geometry the demonstration is somewhat different. There it is assumed that the vertical lines drawn through the points g_1, g_2, g_5, etc., in Fig. 375, represent auxiliary cutting planes perpendicular to both planes of projection. According to the conditions of our problem, the axis of the cylinder is perpendicular to the horizontal plane of projection, hence it follows that the auxiliary cutting planes are parallel to the axis of the cylinder; and therefore each auxiliary cutting plane will intersect the cylindrical surface in two elements (see Art. 405). In the following remarks we shall, for the sake of brevity, confine our attention to the auxiliary cutting plane represented by the line 1*a* 2*a*, Fig. 375. This cutting plane intersects the cylindrical surface in two elements, and these two elements are represented by the points 1*a* and 2*a*; or in other words the points 1*a* and 2*a* are the horizontal projections of the elements in which the cutting plane 1*a* 2*a* intersects the cylindrical surface. Again, because the auxiliary cutting plane stands perpendicular to the vertical plane of projection, the line 1*b* 1*i* in Fig. 374 will be the vertical projection of both elements which are represented in Fig. 375 by the points 1*a* and 2*a*. But now notice in Fig. 374, the given intersecting plane *d e* cuts the line 1*b* 1*i* in the point 1*b*, hence we say that the point 1*b* represents the points in which the intersecting plane *d e* cuts these two elements. These points must lie in the curve of intersection, because they lie in the intersecting plane *d e* and also in elements of the cylindrical surface. Assume now that we turn the intersecting plane *d e* around its trace; in doing so, the points represented by 1*b* will follow a path whose projection is the line 1*b*-2, that is, a line drawn through the point 1*b* and perpendicular to *d e*. (See Art. 323.) When the intersecting plane has been turned so as to coincide with the plane of the paper, then the points 1 and 2 will be those points which in Fig. 374 are represented by the point 1*b*, and the distance between the points 1 and 2 must be equal to the distance between the elements to which they belong; therefore the distance between the points 1 and 2 must be equal to the distance between the points 1*a* and 2*a* in Fig. 375. Furthermore, we have seen that the circumference of the circle b_2 c_2, 5*a* 6*a*, Fig. 375, is the horizontal projection of the curve of intersection; the diameter b_2 c_2 divides this curve symmetrically; therefore the points 1 and 2, Fig. 376, must be at equal distances from the major axis b_5 c_5. Similar demonstrations apply to the method for finding the other points in the ellipse.

492. We commenced our construction by dividing the diameter b_2 c_2, Fig. 375, into a number of equal parts. As far as the correctness of the construction is concerned, it is not necessary to divide the diameter b_2 c_2 into equal parts; we may draw the lines 1*a* 2*a*, 3*a* 4*a*, etc., any distance apart; as long as these lines are drawn perpendicular to the diameter b_2 c_2, and the latter parallel to the ground line, we can always locate the points in the ellipse (Fig. 376) correctly. But such a course will involve an extra amount of labor, as will presently be seen.

It is also advantageous to divide the diameter b_2 c_2 (Fig. 375) into an even number of equal parts; by so doing one of the points of division will fall on the center g_2, and the line drawn through this point of division, perpendicular to b_2 c_2, will give us at once the length of the minor axis. Consequently, if we divide the line b_2 c_2 into an even number of equal parts, as we have done, and draw the diameters b_2 c_2, 5*a* 6*a*, as shown, we divide the horizontal projection of the curve, that is, the circumference of the circle b_2 c_2, 5*a* 6*a* into four equal parts; and therefore we can, with one measurement, lay off four points in the ellipse (Fig. 376). Thus, for instance, setting our compasses to the distance *g*, 2*a* (Fig. 375), we can lay off with the same distance, the points 1, 2, 9 and 10 in Fig. 376, and thereby save labor. Similar remarks apply to the points 3, 4, 7 and 8.

493. Again, for all practical purposes we may place the major axis b_5 c_5 (Fig. 376) as far away from the line *b c* (Fig. 374) as we please without interfering with the correctness of the construction; as long as the points *b* and b_5 lie in a line perpendicular to *b c*, correct results will always be obtained. But when we show the ground line *A B*, as is done in descriptive geometry, then the distance between the lines b_5 c_5 and *b c* must be equal to the distance between the ground line *A B* and the diameter b_2 c_2. Since in working drawings the ground line is not shown, we may, as we have stated, place Fig. 376 at any distance away from the line *b c*.

For determining points in the ellipse shown in Fig. 376 we do not need the view given in Fig. 377. This is shown for another purpose, as will be explained in our next paper.

About the Hobbies of Machinists.

BY FRANK H. RICHARDS.

I suppose I have a pretty healthy and vigorous belief that a machinist, or, for that matter, any other man, is incomplete without a hobby. Everybody knows what a hobby is. It is principally something different from, something out of the regular course of one's daily occupation. It is something that serves as rest and recreation for mind or body or both. It is the rest of change, which is better than the rest of inaction. It is better in many ways; but especially because it is a rest which may and should represent progress instead of retrogression.

In the machinist the existence of the hobby by no means presumes any slighting of his regular business. The best men in the shop are apt to have decided hobbies. The hobby rather speaks of a superabundance of vital or mental force. I might, if I dared, go farther and suggest, for bolder ones to follow it up, that the hobby is a masculine peculiarity consequent upon the largeness of the male intellect.

The hobbies I have known machinists to have range almost over the whole field of human thought and activity. Music, poultry and politics, doctoring, doctrine and dog-fighting, fishing, phonography and flowers, boat-building, mesmerism and chemistry—I don't know what I have not heard of for hobbies. Fellows in the shop get to be known for their hobbies, and in their circle are the accepted authorities upon their specialties. In a jobbing and repair shop this often comes handy. The general repairing in a "live" city calls for the steam man, the printing-press man, the pump man, the elevator man, the dynamo man, etc. Then there is generally another to fall back upon with all sorts of unclassifiable jobs, whom they will usually call the Yankee, or the tinker, or something of that sort.

Sometimes the hobby runs away with a man and carries him forth into fresh fields and pastures new. One leading astronomer of to-day was a boy in a railroad shop, whose mind kept wandering to the stars. He made a telescope and took it out on the street to show the moon and the planets to the crowd, and so got money to buy books to help him along in the same line. Some one picked him up and put him into an observatory connected with one of our leading educational institutions, and to-day he is at the head of it, and is doing faithful work, and earning world-wide distinction. He has already discovered more comets than any other man in America. His friends are apt to consider him a nuisance, he has such a habit of buttonholing them with his specialty. He is all hobby, and unless he soon strikes some secondary hobby for a diversion he will wear out before his time.

The hobby for the young machinist may well be in the line of his trade. In fact there must be something wrong with him, he will be lacking in the essentials of a progressive and successful career, if he does not find himself seeking knowledge outside of the shop, and beyond shop hours, about subjects related to his business. There are a plenty of things for a young fellow to be interested in now. I know the feeling is common, probably we all have it at some time, that we were born too late, that the biggest achievements are all accomplished, that the largest opportunities are all appropriated. Later on we all realize that precisely the reverse is true; and the living proof of it is in the fact that to-day the greatest things of all the ages are being done before our eyes.

While it is true that with the young man in earnest his hobby will be very sure to have some connection with his chosen business, it must still be remembered that the machine business is connected with all the lines of activity, and he can scarcely choose amiss. There will be books to study, there will be questions to investigate in any direction. Photography is not the less interesting and instructive because it happens to be popular. Electricity is a big and open field for study, and the applications of it are only in their infancy.

I believe one of the best of all the hobbies is the habit of writing. I do not know of any way or means whereby so much is to be learned as in the effort to clearly and fully state or describe what we know already. A man who sets out to make an accurate drawing of an existing machine must know more of its detail and construction than one would who only gave a casual glance at it. However good the habit of writing may be, one will not be apt to keep it up in solitude. Writing is done with the assumption that some one will read it. Let it be read. It is by no means necessary that one should know it all to become an acceptable writer for the mechanical journals. I haven't the slightest doubt that in some sense men may know too much to be best able to tell what they know. The man expert on the geography of the earth probably can't direct you correctly to a house in the next street. Important things in the shop may become so familiar that we don't think of mentioning them. It is the one who is a novice in traveling who will see and speak of all the noticeable things, and not the worn-out old stager. So if in the shop you encounter some novel difficulty and a good way out of it, some improved way of doing a familiar thing, some curious action or phenomenon with its explanation or seeking one, something to be done that you don't know how to do, ventilate it all. Nothing in any paper ever strikes everybody; nothing in any mechanical paper ever strikes every mechanic.

Darwin collected good evidence on the connection between cats and clover, showing that the prevalence of cats is essential to its successful growth. I wonder if any one has shown how hobbies help the eyesight. The lesson of the machinist's eyesight is analogous to his mental experience. He is the best thinker whose mind is exercised in thinking. So diversity of occupation is good for a man's eyesight. The sight of machinists fails earlier than it should, and especially when the eye has little change of work. The failing eyesight, or, rather, the changing eyesight, which comes with middle age, is caused, they say now, by a slowness or inability of the eye to readily adjust itself to changing lights and distances; and as the inability is fostered by disuse or by a narrow use, so is it retarded by a wider exercise of the faculty. The machinist who spends all his time in a dark corner watching the monotonous operation of a single machine, and who has no other and different eye exercise, may expect to come early to spectacles. Here is where the benign touch of the hobby is laid on the failing eyes. The machinist who has a lively hobby for rifle shooting, or fishing, or gardening, or any out-door exercise, is the one we may expect to find with the best eyesight, and the most expert at fine and accurate work in the shop.

While I seem to speak of and advise the choice of a hobby, the fact is that the hobby rather chooses the man. There is a choice by the individual, but it is an unconscious or instinctive one. It is nature's reaction from the strain of work, and the work gives direction to the rebound. We can make the most of hobbies when they appear, not despising them in others nor being ashamed of them in ourselves.

It would lead us too far to show how toys and hobbies have been the progenitors of much that the world values and enjoys to-day. Indeed, it might be said that the enlargement of our lives comes mostly through this means. There is a restless and unconscious reaching out for the novel and attractive. We do not know what we shall discover until it is here. We seek amusement; but by and by we find the amusing thing useful, and, before long, necessary; and so we go, and so we grow.

Thirty-Six Inch Back Geared Power Feed Drill.

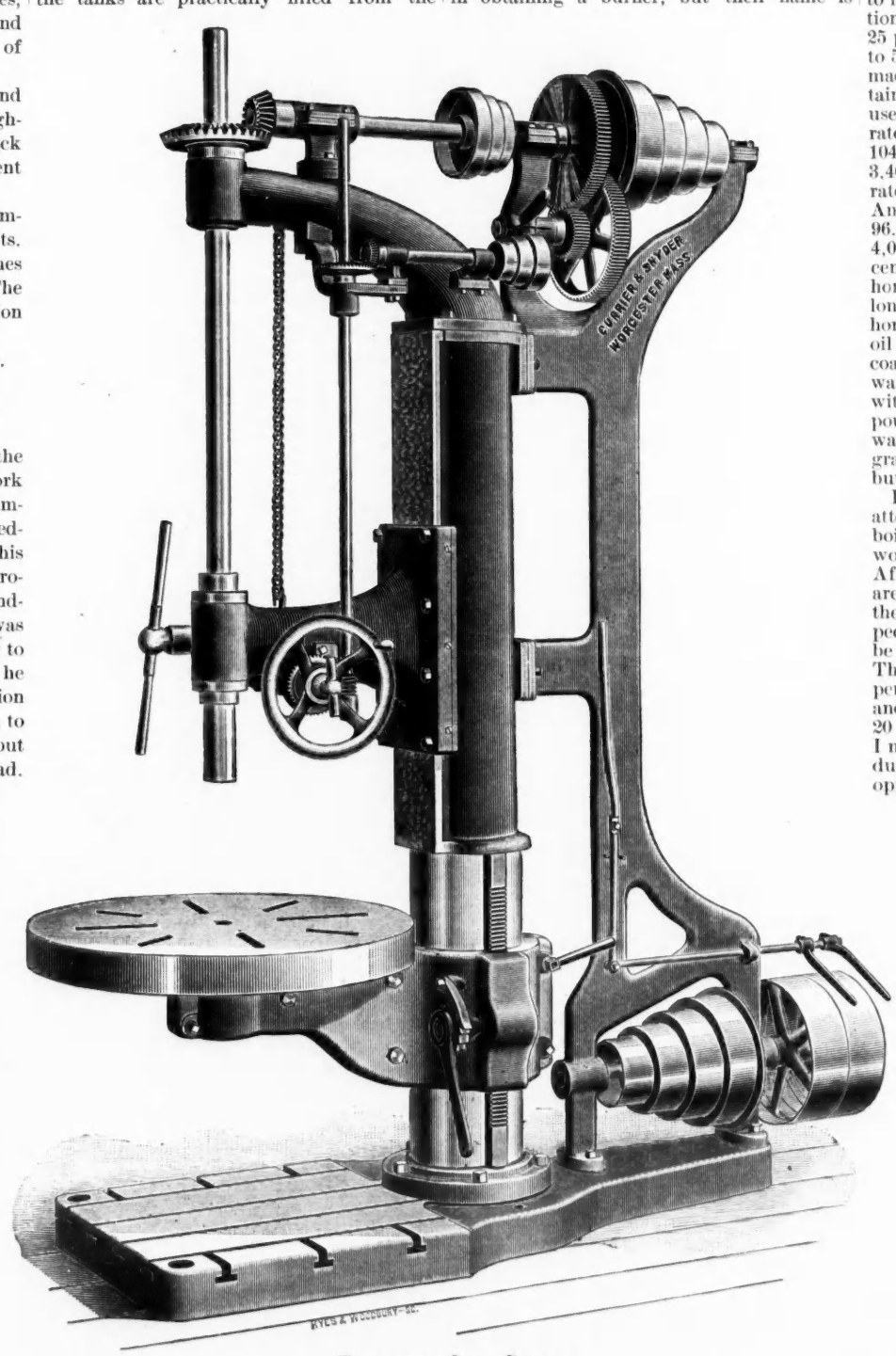
The engraving presented with this represents a drill made by Currier & Snyder, Worcester, Mass. It is made from entirely new patterns, and is a heavy, substantial machine.

The head is scraped to column, and can be instantly brought to any position, vertically. The automatic feed has a range of 30 inches, through the operation of bevel gears and friction, driven by a large cone at the top of machine.

The column is 10 inches diameter, and there is the same swinging capacity throughout the entire range of table. The back brace is made in one piece, and of sufficient strength to prevent spring of column.

The cones and pulleys are of large diameter, and require 3-inch and 4-inch belts. The spindle, of crucible steel, is 2¼ inches diameter, with hole No. 5 Morse taper. The spindle runs in the Brownell anti-friction roller bearing.

The total weight of the drill is 3,600 lbs.



THIRTY-SIX INCH DRILL.

National Electric Light Association.

The eighth semi-annual meeting of the Electric Light Association, in New York City, was an important one in point of numbers in attendance and importance of proceedings. President Duncan referred, in his address, to the increased interest in the proceedings, as manifested by the large attendance, and to the fact that the association was becoming authority in matters pertaining to its special field. As an evidence of this he said that in the early days of the association foreign technical papers paid no attention to the papers read, except to ridicule them; but lately they copied nearly every paper read. He said that there were now in operation in the United States 5,351 isolated plants and central stations, supplying 192,500 arc lights and 192,500 incandescent lights. There were employed in electric lighting 459,495 horse-power of steam engines. Thirty-four electric railways were completed and in operation, having an aggregate of 138 miles of track, and operating 223 motor cars at an expenditure of 4,180 horse-power from stationary engines. There were also in process of construction 49 electric railways, with 189 miles of track; these would operate 244 motor cars. There had been an increase in the capital of electric light companies, in the six months last past, of more than $42,000,000. In regard to the use of stationary electric motors, no reliable data had been compiled, but there were at present shops employing as many as 1,500 men engaged in their manufacture.

Regarding permanent headquarters President Duncan said:

The difficulty of obtaining reliable statistical information in regard to the various electrical industries, and also for the purpose of giving continuity to the whole association from one convention to another, warrants the president in urging upon the association the necessity of establishing a permanent office which shall be a repository of all information relative to the allied electrical industries and a means of intercommunication between its members, and from which the officers and executive committee can administer the affairs of the association. This office should contain a good reference library of electrical works, complete files of all domestic and foreign electrical and other electrical journals, and the repository of the archives of the association. It should be a place where every member of the association should feel at home, and where he would naturally go for any electrical or other information that it contained. A very slight increase in the running expenses of the association would maintain such an office, and, when established, it would, from its innate value, increase the membership of the association to such an extent that the running expenses of such an office would take care of themselves.

A paper on Petroleum Fuel, prepared by S. S. Leonard, was presented. The following extract from this paper will be of interest:

Permit me to describe the arrangements for the handling and use of this oil put in under the supervision of the writer. The oil is received in tank cars holding from 90 to 150 barrels each (42 gals. to a bbl.) From these cars it is drawn off through a valve in the bottom of the car to a storage tank or tanks, there being two of them, holding about 320 bbls. each. These are placed under ground, so that the oil runs from the car into them by gravity; care should be taken not to spill the oil or stir it up more than is necessary, as the odor from it is fully equal in strength to that of new-mown hay, if not quite as agreeable. To prevent the stirring up of the oil, the supply pipes entering through the top of the tanks run nearly to the bottom, so that the tanks are practically filled from the bottom. In the top of each tank are manholes and a vent pipe; this latter is extended above the tanks a short distance. These tanks, which are boiler shaped, are placed end to end with a space of about eight feet between them. This gives room to get at the various pipes. They are joined together at the bottom by a pipe, which also connects with the supply pipe running to the boiler room. Then in the bottom of each is a drain pipe which will admit of cleaning them out whenever necessary. There is also a gauge glass in the end of each, to show how much, if any, water is in them; there is also a gauge made by a copper float, which indicates the amount of oil in each tank. In cold weather a small steam coil is inserted in the tank car around the mouth of the valve, to heat the oil so that it will flow readily, for when the thermometer gets in the vicinity of 30 or 40 below, the oil is apt to be a little thick. Care should be taken not to heat the oil too much, for when hot it generates considerable gas, which is not only very odorous, but is really the cream of the fuel. I think it an advantage to have the storage tanks underground, there being less danger from them in case of fire, and during the winter the oil is less likely to chill. An open light should never be used near them, although the oil itself is really hard to ignite unless heated to a certain degree; still there is apt to be more or less gas around, which is quite explosive if brought in contact with fire. The supply pipes to the furnaces are provided with a valve where they enter each tank, also one in the fire-room. This pipe, a two and one-half inch one, is enlarged to a six-inch for about four feet, and in this six-inch pipe a small steam pipe is inserted. With this, the oil is heated from 130 to 140 degrees. This lightens it so that it burns more readily, or I should say is turned into gas.

We now come to the burners, which are also fed by gravity, as the storage tanks, although underground, are still higher than the furnaces. One might suppose that, owing to the recent introduction of petroleum as a fuel, that some difficulty might be experienced in obtaining a burner, but their name is legion, and they are as numerous as electric light systems, and like them in another respect—each man's is the best. Our experience has been that the more simple the burner the better the result. One that thoroughly vaporizes the oil before burning it, is, we think, preferable to one that burns the oil. In the former there can possibly be no waste. In furnaces where we have been using this kind of a burner the bricks are as clean as they were the day they were put in. Steam and hot air are the other ingredients that are used in connection with the oil, and an abundant supply of the latter we have found adds very much to the efficiency of the fire.

Regarding the proper settings, circumstances will determine that to a certain extent. An excellent plan is given by the Standard Oil Company in their pamphlet, "Oil as a Fuel." This we have adopted, with a few modifications which we found necessary by experience. There is no doubt that a hotter fire can be obtained from oil than from coal or wood, and when the oil is properly used the smoke nuisance is solved which has been agitating the minds of the people of some of our large cities, for there is not a particle of smoke to be seen issuing from the stack, not even when everything is running full blast.

A word as to its danger: When properly put in and handled with ordinary care, or when good common sense is used in the employment of this oil, I do not see why it should be any more apt to cause trouble than coal, although the insurance companies insist on higher rates when used. I think it is more from ignorance of the subject than from there being any more danger. At the same time I am willing to admit that it could be put in and used in such a way as to greatly increase the danger of fire. So might your house be wired for electric lights, piped for gas, or a kerosene lamp hung on your gasoline stove filled in such a manner that the fire risk is much greater than with your neighbor who uses electric lights, gas, kerosene or gasoline the same as you do, but has his put in properly and handles it as it should be. As to its economy over coal, I have already mentioned that there was a saving of from 20 to 25 per cent. on the cost of fuel, and from 40 to 50 per cent. in labor. From tests recently made by us, the following figures were obtained: 111.34 horse-power running six hours used 250 gallons of oil, costing $5.50, or at the rate of 70 cents per 100 horse-power per hour; 104.8 horse-power running six hours used 3,461 pounds of coal, costing $5.45, or at the rate of 86 cents per 100 horse-power per hour. Another test gave the following figures: 96.45 horse-power running 8 hours used 4,014.75 pounds of coal, costing $6.32, or 80 cents per 100 horse-power per hour; 115.54 horse-power running 7 hours used 233 gallons of oil, costing $5.05, or 62 cents per 100 horse-power per hour. On the above figures, oil is from 17 to 32 per cent. cheaper than coal. The highest evaporation made with oil was 14.8 pounds of water per pound of oil with feed water at 103, and with coal 5.38 pounds of water per pound of coal, feed water at 103. The coal used was a good grade of Illinois lump, costing $3.15 per ton, but which is usually worth $3.25.

In the matter of labor one man can easily attend from seven to ten 150 horse-power boilers, and then have less to do than he would were he firing one boiler with coal. After a week's run with oil your boiler flues are much cleaner than they would be from the use of bituminous coal for one night, especially western coal. Your fire room can be kept as clean as your dynamo room. There being no ashes you are saved the expense of handling them as well as the dirt, and the former is no small matter where some 20 tons of coal are being used every 24 hours. I might say that the above tests were made during a part of the day's run, and it is our opinion that a more favorable showing could be made with the oil where a larger number of boilers are in use. It seems to work better with a good fire than where a small fire is sufficient. With our pipe lines affording a cheap method of transportation, the future of petroleum fuel is assured; and I think there is no doubt that, with true Yankee ingenuity, a burner or some method will be brought forward by which the use of petroleum as a fuel will be greatly improved.

In the discussion of this paper there was shown much diversity of opinion as to the comparative cost of coal and oil. There was also some difference in opinion as to the probability of injuring the boiler by the use of oil. Some instances in which the use of oil had been abandoned were cited.

Some very successful experiments in the way of breaking up steel castings have recently been performed at Messrs. Goodwin & Co.'s foundry, Ardrossan. The castings weighed in some instances as much as 3½ tons, and having become useless, it was necessary that they should be broken up before they could be put into the cupola to be remelted. For this purpose Messrs. Goodwin engaged a few of the dock employes to try the experiment with dynamite. With the 3½ ton mass they were unsuccessful on five different occasions. Eventually Mr. Daniel Blyth, who has been in the service of Nobel's Explosives Company for the long period of fourteen years, brought his wide experience to bear on the difficulty. He charged the largest casting, weighing 3½ tons, with blasting gelatine, the explosion of which at once rent the casting into fragments. The result was eminently satisfactory.—*Iron.*

Notes on the Expansion of Steam.

By RICHARD H. BUEL.

TENTH PAPER.

In the two tables (A and B) accompanying this article will be found the results for all A are used in such formulas of the table of June 30 as are applicable to the changed conditions; the reference numbers in Table B indicating what formulas of the table of June 30 are employed. Comparing the final results (line 57 of Table B) with the final results (line 57 of the table June 30) for the unjacketed cylinders, it will be seen that the

A.—Theoretical Results of Using Steam Expansively—Non-Condensing Engines—Dry Saturated Steam-Jacketed Cylinders. (Results and General Formulas Specially Applicable to these Conditions.)

ITEM.	SYMBOL.	FORMULA.	POINT OF CUT-OFF. Full Stroke	3/4	1/2	1/3	1/4	1-6	1/8	1-12	NUMBER FOR REFERENCE
Sixteenth root of real cut-off	$(\frac{1}{R})^{\frac{1}{16}}$	$(\frac{1}{R})^{\frac{1}{16}}$	1	.98287	.95960	.93747	.92219	.90169	.88682	.87081	58
Mean pressure for stroke, plus clearance, corrected for back pressure, pounds per square inch	M	$\frac{m+16\times C\times\left[1-(\frac{1}{R})^{\frac{1}{16}}\right]}{R}-b$	77.5	74.7	64.6	51.8	42.7	30.8	23.1	15.3	59
Ratio of compression. When final cushion pressure is less than initial pressure.	l	Assumed.	1	1.3185	1.9346	2.81	3.6549	—	—	—	60
Ratio of compression. To make final cushion pressure and initial pressure equal.		$(\frac{P}{b})^{\frac{1}{16}}$	—	—	—	—	—	5.1574	5.1574	5.1574	61
Seventeenth power of sixteenth root of ratio of compression.	$l^{\frac{17}{16}}$	$l^{\frac{17}{16}}$	1	1.341	2.016	2.997	3.963	5.808	5.808	5.808	62
Final cushion pressure, pounds per square inch.	L	$b\times l^{\frac{17}{16}}$	17.5	23.5	35.3	52.5	69.4	100	100	100	63
Sixteenth root of reciprocal of ratio of compression.	$(\frac{1}{l})^{\frac{1}{16}}$	$(\frac{1}{l})^{\frac{1}{16}}$	1	.98287	.95960	.93747	.92219	.89587	.89587	.89587	64
Absolute cushion pressure, pounds per square inch.	k	$L\times\frac{16\times\left[1-(\frac{1}{l})^{\frac{1}{16}}\right]}{l-1}$	—	20.2	24.4	29	32.5	37.5	37.5	37.5	65
Ratio of expansion up to .95 stroke	—	$\left(\frac{\frac{1}{r}+\frac{c}{100}}{.95+c/100}\right)^{\frac{17}{16}}$	—	.786	.523	.352	.266	.182	.137	.0969	66
Absolute pressure at .95 stroke, pounds per square inch.	B	$C\times\left(\frac{1/2+c/100}{.95+c/100}\right)^{\frac{17}{16}}$	91 ass'd.	72.7	49.7	34	25.9	17.8	13.5	9.6	67
Weight in pounds of a cubic foot of steam at pressure B.	W	From tables.	.2107	.1705	.1193	.08346	.06464	.04544	.03505	.02544	68
Weight in pounds of a cubic foot of steam at pressure L.	w	From tables.	.04472	.05899	.08646	.1256	.1633	.2303	.2303	.2303	69
Felted surface, square feet	(a)	Assumed.	18.9	19.7	22.4	28.4	34.5	50.3	68.7	113.3	70
Unfelted surface, square feet	(f)	$2\times\frac{(A)}{144}+3.1416\times\frac{p}{12}\times\frac{S+(P)}{12}$	3.7	3.9	4.4	5.7	6.9	10.1	13.8	22.9	71
External temperature of jacket, Fahrenheit	(t)	Assumed.	70°	70°	70°	70°	70°	70°	70°	70°	72
Internal temperature of jacket, Fahrenheit	(T)	From tables.	328°	328°	328°	328°	328°	328°	328°	328°	73
Latent heat of steam in jacket, British thermal units per pound.	(L)	From tables.	884	884	884	884	884	884	884	884	74
Heat lost by condensation hourly, British thermal units.	Q	$1.1\times\frac{1}{t}(a)\times[(T)-(t)]\times.5+(f)\times[(T)-(t)]\times2.5$	5307	5563	6300	8074	9791	14304	19359	32325	75
Probable amount of steam condensed in jacket hourly, pounds.	(K)	$\frac{(Q)+1.1\times i}{(L)}$	6	143	243	350	444	595	713	892	76
Probable consumption of steam hourly, pounds	(w)	$Q+(K)$	5857	5023	4103	3631	3488	3479	3714	4225	77

B.—Theoretical Results of Using Steam Expansively—Non-Condensing Engines—Dry Saturated Steam-Jacketed Cylinders. (Results Calculated by the General Formulas of the Table published in AMERICAN MACHINIST, *June 30, 1888, Using the Numerical Data of Table A.)*

ITEM.	SYMBOL.	POINT OF CUT-OFF. Full Stroke	3/4	3/8	1/3	1/4	1-6	1/8	1-12	NUMBER FOR REFERENCE.
Mean pressure, corrected for back pressure and clearance, pounds per sq. in.	n	76.7	73.8	63.4	50.1	40.8	28.7	21.2	13.2	23
Mean pressure, corrected for back pressure, clearance and cushion, pounds per square inch.	t	76.7	73.8	63.2	49.4	39.5	26.2	19.1	11.1	29
Probable mean effective pressure, pounds per square inch.	e	72.9	70.1	60	46.9	37.5	24.9	18.1	10.5	30
Probable effective horse-power	(E)	150.6	150	147.1	143.8	142.6	139.4	139	133.6	39
Pounds of steam used hourly, calculated by piston displacement.	Q	5851	4880	3860	3281	3044	2884	3001	3333	47
Probable consumption of steam hourly, per effective horse-power pounds.	(W)	38.9	33.5	27.9	25.2	24.5	25.1	26.7	31.6	57

C.—Test of a Non-Condensing Engine, with Steam Jacket and Saturated Steam.

Number of Experiment.	Diameter of Cylinder. Inches.	Stroke. Inches.	Clearance, per cent. of piston displacement.	Absolute initial pressure, pounds per square inch.	Apparent cut-off, fraction of stroke.	Piston speed, feet per minute.	Effective horse-power.	Steam hourly, per effective horse-power. Pounds.
1				118.8	.13	450	152.6	25.7
2				118	.16	450	170.9	25.4
3				92.4	.23	435	153.1	23.5
4	22	43.5	3.7	92.9	.3	439	185.8	24.1
5				118.5	.58	455	211.6	24.8
6				49.9	1	439	134.7	50.4

the cases of cut-off assumed, when the engines are steam-jacketed. The general table published in the AMERICAN MACHINIST of June 30, 1888, contains several formulas which are applicable to the present conditions. It will be seen by the reference numbers of Table A that this table contains formulas for calculating some of the data different from the formulas used for calculating the same data when the engines had unjacketed cylinders; and a comparison of these formulas and results with the formulas and results in the table of June 30 will show clearly what differences are caused by attaching a steam jacket.

In Table B, the data calculated in Table economy at short cut-offs is greatly increased by the use of the jacket, on account of the diminished condensation. The results contained in line 57, Table B, are well within the figures which are attainable in actual practice, as will be evident by an inspection of Table C, which gives the actual steam consumption per effective horse-power (measured by a friction brake) of a Corliss engine with jacketed cylinder. The effect of using superheated steam in unjacketed cylinders will next be considered.

In Berlin, and other large cities in Germany, mortar is manufactured in large quantities, and sold to builders by the barrel.

Circumventing a Railroad.

An interesting story of how the Tidewater Pipe Line Company got ahead of the Pennsylvania Railroad Company in getting its pipes across the main line of the railroad in Chester county is told by a resident of West Chester. At the time the war was being waged by the railroad people against the oil men to prevent the completion of the pipe line, Colonel Porter and a friend drove out in the country very quietly one day to take a look at the crops, and, if possible, find some way of getting under or over the railroad company's tracks—for this they had to do. After passing through Downingtown, following the line of the railroad, they saw a large culvert running under the tracks. There was no stream of water running through the culvert, and no apparent reason for such a break in the embankment, and Colonel Porter made a few inquiries. He soon learned that the owner of the farm, when the railroad was built, stipulated that the company should forever maintain a culvert to allow cattle to pass from one part of the farm to another without the danger of crossing the tracks. It did not take Colonel Porter long to strike up a bargain with the owner of the farm for its purchase. The place is marked by a big streak of whitewash, showing where the pipe is buried.—*Philadelphia Record.*

The Influence of Aluminum Upon Cast-Iron.

Mr. W. J. Keep, C. E., read a very interesting paper at the recent meeting of the American Association for the Advancement of Science at Cleveland, entitled, The Influence of Aluminum Upon Cast-Iron.

The following abstract of the paper was published in the Cleveland *Leader and Herald:*

ALUMINUM AND CAST-IRON.

Aluminum is a metal, white in color, and very tenacious, and it alloys readily with iron. Cast-iron ordinarily used is iron which contains all the carbon that it could absorb during its reduction in the blast furnace. This carbon, if chemically combined with the iron, cannot be seen. If mechanically combined as graphite it becomes visible. The present knowledge concerning this subject is that fused wrought-iron, a mixture of cast-iron and steel, or steel alone, either of which would make castings full of blow-holes, will make solid castings if as small a quantity as $\frac{1}{16}$ of 1 per cent. of aluminum is added just before pouring. The physical tests that we have employed are known as "Keep's tests," and by them we are enabled to make apparent to the eye the influence of any element, such as aluminum, upon cast-iron. When it was understood that we were to undertake this examination, the Cowles Electric Smelting and Aluminum Company, of this city (Cleveland), kindly furnished us what ferro aluminum we needed, and Professor C. F. Mabery, S. D., and L. D. Vorce, of the Case School of Applied Science, of this city, volunteered to undertake the chemical examination of the test bars.

Mr. Keep illustrated his paper by a series of diagrams, picturing the effects of various percentages of aluminum in a large number of tests, and also by a full set of the test bars themselves. Very briefly, the remarkable results presented in the paper are recounted:—

First—The solidity of castings, and the prevention of blow-holes. It is almost impossible to get a solid casting from white iron, but apparently sound castings of white iron resisted a weight of 379 pounds; with $\frac{1}{16}$ of 1 per cent. of aluminum added, the strength was increased 44 per cent. The secret of the strength is in the compactness of the grain.

Second—Does the aluminum remain in the iron to exert an influence when the iron is remelted? To determine this a series of six heats was made with the white iron, to the first of which was added one-fourth of 1 per cent. of aluminum. This amount increases its resistance to weight 20 per cent. and impact 70 per cent. To each subsequent heat, portions of the original white iron were added to bring down the percentage of aluminum. The strength, due to the original aluminum addition, was apparent in all the six meltings. In further tests he added to the first heat one-fourth of 1 per cent. of aluminum, and a like amount at each subsequent heat, the result showing conclusively that the bars contain $\frac{1}{4}$, $\frac{1}{2}$, and $\frac{3}{4}$ per cent., as was intended. It was therefore proved that the aluminum remained in the metal.

Third—The effect of the aluminum upon the grain, or the changing of carbon from the combined to the graphitic state. The white of the original iron is turned to gray when reaching the fifth heat, each addition of aluminum producing a corresponding change of color, showing conclusively that aluminum causes the combined carbon to take the graphitic form. The influence of the aluminum is such that a thin casting is as gray as a thick casting.

Fourth—It takes away the tendency to chill. Chill is caused by molten iron running against a body which rapidly withdraws its heat, causing it to retain its carbon in the combined form. Aluminum causes the carbon to be turned to graphite before it can be caught in its combined form.

Fifth—Aluminum causes a lessening of the thickness of the sand scale, making it easier to cut the metal.

Sixth—The resistance to a load gradually applied. All the tests show that aluminum has increased the strength.

Seventh—The resistance to a load suddenly applied or impact. The tests show that the power to resist a blow has increased more rapidly than to resist a dead weight. The increase in strength is due probably to the soundness of the castings.

Eighth—The elasticity. The compactness of the grain, and the increase of graphite, increases the elasticity when aluminum is added.

Ninth—Permanent set is less, for the reasons just given.

Tenth—The effect upon the shrinkage of the iron. The sudden changing, due to aluminum, of the combined carbon to the graphitic form, at the instant of solidification, on account of the increased space occupied by the graphite, causes a swell at the instant the metal becomes solid, and the iron on cooling will occupy more space, or will shrink less. White iron often shrinks three-tenths

of an inch to the foot, while gray iron sometimes shrinks as little as one-tenth of an inch. Aluminum, therefore, when added in sufficient quantities, takes out shrinkage.

Eleventh—The fluidity of the metal. The tests show that aluminum added to iron low in silicon increases fluidity, but that, as the silicon increases, aluminum does not add to the fluidity, though it tends to produce sharp castings.

This brief summary of Mr. Keep's paper shows the great benefit which is now promised to the iron founders by the rapidly falling price of aluminum, as cheapened by the electric furnace. The paper is to be followed by a second, giving the chemical proof of the correctness of these statements.

The first decision of any court touching the standing of trusts is that of the Supreme Court of Tennessee. It is in relation to the cotton seed oil companies trust, at Memphis. The Court held, in substance, that a corporation that joined a trust did so in violation of its charter. This decision is the first blow that these abnormal combinations called trusts have received; but if it is sustained—and it is good common sense—it will be a hard blow to the whole business. It is said that these combines cannot be restrained in England. It is just possible that they may be here.

Measuring Screws—Shape of Screw Thread Affected by Angle.

By JARNO.

FIRST PAPER.

The article on "Making Taps of Standard Size," by Fred J. Miller, in the AMERICAN MACHINIST of Aug. 11, 1888, deserves to be carefully read. It brought up several things in connection with measuring screws, some of which I give in the following paper.

The method of measuring a screw, by the sides of its thread, given in this paper, was kindly shown to me at the Brown & Sharpe M'f'g Co.'s works. I understand that it has been used in Providence, R. I., for some years.

To understand the principle of this method, let us have either a vernier or a micrometer caliper, whose jaws have nibs like Fig. 1. Let the jaw A have a grooved nib, into which the nib of the jaw B exactly fits. Let the caliper indicate zero, just as the sharp corners of the two nibs touch each other, as in the figure.

Now, if the jaws are opened, as in Fig. 2, the caliper will indicate or show the distance that is now between the nib corners that touched each other, when the caliper jaws were closed as in Fig. 1. Thus the distance X is the same as the distance between the two zero lines, the measurement indicated by the caliper.

Now place between the nibs a thin mid-section, $C\,D$, of a sharp, single-thread screw.

A thread A, comes exactly opposite a space B in any screw having an odd number of threads, as one thread, three threads, five threads, and so on.

Let the corners of the jaw nib B touch the sides of a space and let the corners of the nib A touch the sides of a thread opposite this space. A little consideration will show that the distance y from the top of the thread to the bottom of the opposite space, is equal to the distance X. That is, our caliper shows what would be the distance from the top of a sharp thread across to the bottom of a sharp space. This principle enables us to measure the diameter of an angular thread screw by the sides of its thread.

If the thread be a sharp one, the measurement, indicated by the caliper, will be equal to the depth of the thread as at B, Fig. 3, less than the diameter of the screw. That is, if we subtract the depth of the sharp thread from the diameter of the screw, we shall have for a remainder, the distance measured by the caliper.

For the common, sharp, sixty-degree thread, the depth is equal to .866″ divided by the number of threads to one inch. That is, the depth of a one-inch pitch thread is .866″. For a screw one inch diameter, ten threads to an inch, the depth is one-tenth of .866″ or .087″ nearly, and the measurement of the thread, as in Fig. 2, is the remainder after subtracting .087″ from 1″, which is .913″.

Letting D equal the diameter of the screw, letting n equal the number of threads to one inch, letting y equal the distance measured by the caliper, and the rule for the depth of a sharp sixty-degree thread can be given by the formula $y = D - \frac{.866''}{n}$.

We can also measure the diameter of a screw having the U. S. standard thread, and also screws having threads of any angle, if we make the right allowance for the depth. The angle of the U. S. standard thread is sixty degrees, but, considered by its sides, it is only seven-eighths of the depth of a sharp thread, because one-eighth of the pitch of the thread is left flat at the top of the thread.

As the nibs of the caliper touch the sides of a space and also the sides of the thread opposite this space, twice one-eighth of the depth, or one-fourth of the depth of a sharp thread, must be taken out of the sharp thread depth in figuring the measurement for a U. S. standard thread. That is, instead of subtracting the depth of a sharp thread from the diameter of the U. S. screw, we subtract three-fourths of the depth. Three-fourths of .866 is .6,495, or practically .65. For the purpose, therefore, of measuring a U. S. thread screw, as in Fig. 2, we can subtract from the diameter of the screw, .65″, divided by the number of threads to one inch.

Example.—What size shall we set the caliper in order to measure a U. S. thread screw, three-quarters of an inch diameter and ten threads to one inch? Dividing .65″ by 10, the number of threads to one inch, we have .065.″ Subtracting .065″ from .750″, the diameter of the screw, we have .685″ as the distance X, Fig. 2, to be measured by the caliper.

The foregoing gives an idea of the principle of measuring screws, by the sides of their threads. In practical use, the sharp corners of the nibs A and B would soon get worn, and then the caliper would not show the exact size.

In actual use it has been found well to have the nibs shaped like A and B, Fig. 3. The nib A has a sixty-degree groove cut through its face. This nib swivels in the caliper jaw. It is convenient to have the nib A swivel, because it will then adjust itself to the position of the thread of the screw to be measured. If this nib does not swivel, great care must be taken to hold the caliper so that the thread of the screw will go to the bottom of the nib groove. The nib B is simply a sixty-degree pointed piece, like the center of a lathe. This nib is fixed in the caliper jaw.

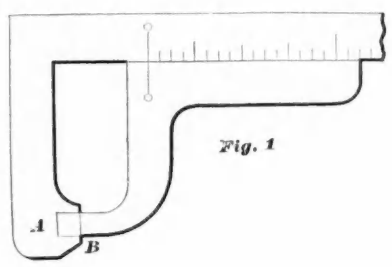


Fig. 1

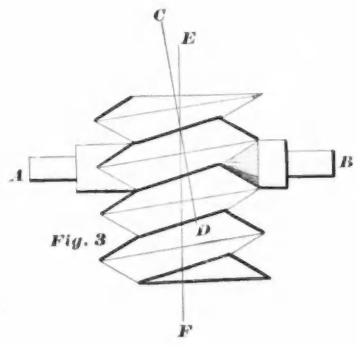


Fig. 3

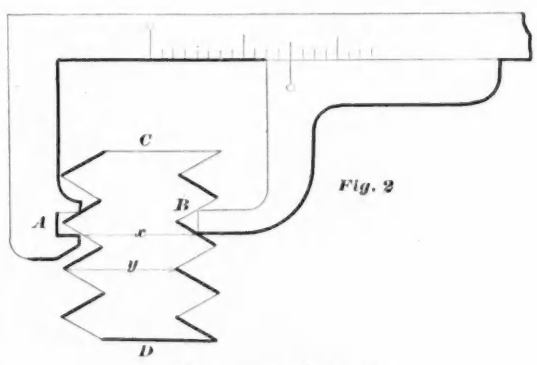


Fig. 2

MEASURING SCREWS.

For a U. S. thread the nib B should be flattened at the end, in order not to bear on the flat part at the bottom of the thread. The flat part on the end of the nib B should not be less than the flat at the bottom of the space into which the nib goes. Brown & Sharpe have several calipers with different sized nibs, so as to measure screws of different pitches.

As I understand Mr. G. E. Whitehead, the Rhode Island Tool Co. have a patent in which is claimed the principle of putting different sized nibs in the same caliper, particularly when the nib A is used in the frame of a micrometer caliper. The nib is then called an "anvil." This principle is very like using different bits in the same bit stock, or like having more than one turning tool to go in the same lathe, and is an important principle in many kinds of mechanical work.

I think that, of all the methods of measuring the diameter of a screw, this one is the most accurate, though there is, theoretically, a slight inaccuracy in measuring screws as in Fig. 3. The nibs are supposed to bear along the sides of the screw thread, as would appear from Fig. 3, but the bearing is not quite perfect. The reason that the nibs do not quite fit the thread and space is because the thread, taken in the position that the nibs bear, is not of the same angle as the thread is, when taken along the line parallel to the center. Thus, on the line $C\,D$ the thread is narrower than it is on the line $E\,F$, while the depth of the thread does not vary. Hence the thread is sharper, when taken on the line $C\,D$, than when taken in the usual way on the line $E\,F$. The thread will, therefore, bear only in the bottom of the groove, in the nib A, but this will make no difference in the measurement, as far as the nib A is concerned. The nib B, however, will not go quite to the bottom of the space, because the space has a sharper angle than the nib. Hence, as it is the bottom of a space that we are supposed to measure from, our measurements will not be quite exact. In practice, this inaccuracy can hardly be seen.

English and American Locomotive Practice.

By W. H. BOOTH.

FIFTH PAPER.

In no one respect has there been more useless argument than in regard to the use or otherwise of trucks or bogies.

We have already drawn attention to the fact that the lateral stiffness of the bar frame would early call for some means of obtaining a flexibility of wheel base as soon as the length of the locomotive grew beyond the few feet of the earliest engines.

In addition to this cause we know that from the first in so extensive a country as America, if railroads were to be built at all they must be built cheaply, and so it is that curves were laid out of a radius much less than had been considered possible or practicable in England, and such curves called for a special construction of vehicle to safely traverse them.

In the early days of the locomotive its powers were not foreseen to any great extent, and so much of the railroad system of England was laid down when the locomotive was a comparatively puny machine, that all the earlier English lines are characterized by great directness, and costly tunnels are found where a detour would be now made, in order to avoid curvatures of less than about half a mile radius. Early gradients also were fairly moderate, and to obtain such in an undulating and hilly country, an enormous amount of bridging and embanking and cutting was undertaken, of which an untraveled American can have little idea. With such straight and perfect roads, it was unnecessary to employ locomotives of any great lateral flexibility, and hence the truck was very little used. Later English roads, such as the Midland and various extensions in the more hilly portions of the country, which have been made with a better knowledge of the capacity of the locomotive, have departed widely from the original type of construction, and with the greater curvatures now allowed it has been on many roads found advisable to employ engines with leading or trailing trucks.

The principal English road, the London and Northwestern, has not as yet used the truck, and still runs many of its fast trains with engines of a rigid wheel base, so few and unimportant are the curves on this system; but the later engines of this road, notably the compound class, have radial axle boxes to the leading pair of small wheels, and these are found perfectly satisfactory.

Complaints that English locomotives are stiff and rigid machines fall groundless in the presence of the solid nature of the English truck, to compare with which there is nothing in America. Similarly, English engineers often fail to grasp the reason for the excessive limberness of the American engine, which is really called for by the numerous imperfections of the road bed. Such a difference of practice always must exist to a greater or less degree, at least in the Northern States and Canada, for no piece of track could possibly be maintained in the condition of any ordinary English road, simply because climatic reasons will not allow it. Hence again we find natural conditions exercising great weight in determining design, and in this item of limberness we find more pronounced in America the truck, the equalizer and the cross equalizer, as well as more easily bent springs and a general looseness of construction, much of which is quite uncalled for on a level road, and would not be found needful if an American engine were run upon an English road, whilst an English engine run on an American road, say during the breaking up of the frosts, would show a need for the same appliances as have been shown needful in America.

It is just upon such points as these that intelligence is required in criticism, and in most discussions which have appeared, both sides, as a rule, have shown singularly small capacity to grasp the conditions, both climatic and commercial, which have been factors in the evolution of the different types of engine.

In respect to dimensions of parts, the chief visible difference between the locomotives of the two countries is the wheel diameter. For any class of work the wheels of the English engine are larger. Into the reasons of the facts which determine this difference we cannot inquire, but clearly the main facts are: The higher speeds of both passenger and freight trains in England, and their less weight, especially of the freight trains, for many of the passenger trains are perhaps little, if any, less in weight than

similar American trains, and English passenger engines are fully as heavy as American, though the freight engines are so much less. We may simply take the higher speeds as we find them, and can then understand the larger wheels. Though wheels have been employed as much as 8½ and 9 feet in diameter, the customary maximum diameter is 8 feet 1 inch, and engines with such wheels have a single pair of drivers only. These engines do the same class of work on one company's line as are done on others by engines with four coupled wheels of 6½ and 7 feet, the latter diameter being the size for a standard coupled express engine. Such an engine in America would not have wheels of more than 68 inches, for the class K of the P. R. R. is exceptional in their 78-inch wheels, and quite many English engines of the express type, for working a fast stopping traffic in the hilly country, have coupled 72-inch wheels, fully 12 inches larger than would be employed in America.

Even with the higher speeds of England, it is not altogether easy to understand why there should be this difference in wheel diameters, for much of the fastest traffic in America might well be worked by large-wheeled engines, and it seems rather strange, also, that more single driver engines have not been used by American engineers. In England they do fully as good and severe work as coupled engines, and with improved methods of sanding they are growing in favor, for it is becoming daily better understood that though, at starting, the adhesion of a locomotive is likely to be less than the tractive force developed at the rail, yet when under way, a single pair of drivers has all the adhesion necessary to utilize to the full the power developed in the cylinders at such a cut-off and compression as is found at any fair speed. If such is the case in England, where large wheels, to develop an equal traction with small wheels from the same size of cylinder, must have a later cut off and a higher average pressure, must it not be still more the case with a supposed single engine in America, with say a 6½ feet driver only?

The subject is certainly one which begins to demand the close attention of our own engineers, for the American traveler is not likely to remain content with an average speed of 37 miles per hour on a long journey, when speeds of nearly 50 miles are obtained for 400 mile journeys in England with daily frequency and punctuality. Very high speeds are often run in America, but these are not regular, and often due to the special spirit of some individual engineer, and it certainly does seem probable that such speeds would be oftener attained, and would lead to a general advance of speed, if larger wheels were used for express engines.

They have a novel sand dryer in connection with the roundhouses of the Chicago, Milwaukee & St. Paul, at West Milwaukee. They use steam for heating the roundhouse, and the boiler also supplies steam for a small engine that has to be used in summer as well as winter. The smoke-box of this boiler is extended sufficiently to provide surface for a sand dryer, and the heat that would otherwise pass through the chimney is utilized for drying sand. The plan works well, and all the sand needed for a large force of engines is dried with almost no waste of fuel. Many sand dryers use up an enormous quantity of coal for the work done; and we commend the West Milwaukee plan for those interested in utilizing fuel to the fullest extent. Many of the boilers used to supply steam for heating roundhouses are used only in winter, and in that case a stove sand heater would be necessary, but it would in most instances pay to use the smoke-box of the boiler to dry sand at the season when the greatest demand for that aid to adhesion exists.—*National Car and Locomotive Builder.*

In the trial of a new steam street car in Sweden, the cost of fuel is said to have been only about two cents per mile. The car will seat 24 passengers, the engine being in one end of the car. The cost of fuel seems to be remarkably low.

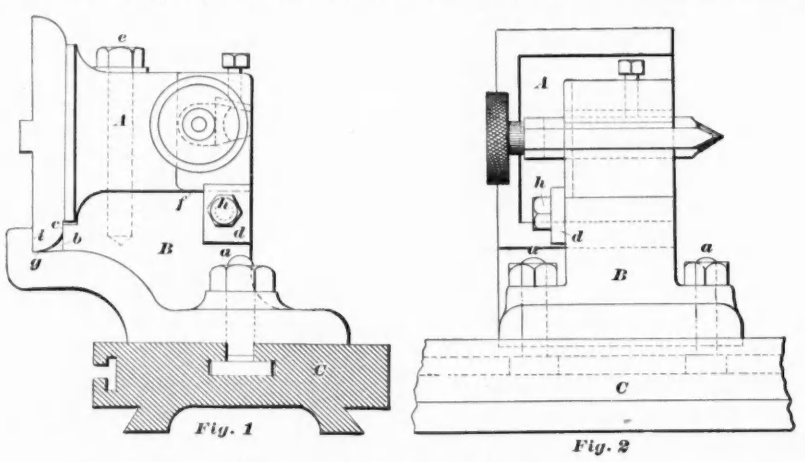
Milling Machine Tail Center.

By A. B. Landis.

Several years ago I saw in the American Machinist or some other mechanical journal (I cannot now find the article) a description of a tail stock for a milling machine,* adapted to use facing or end mills by presenting that portion of the regular tail stock which is the top, to the side towards the milling arbor, to allow of facing mills to pass the tail stock and yet cut close to the center. This is a very valuable feature, and can best be appreciated by those who have had a varied experience on the universal milling machine. How often you wish to flatten or square the end of a round piece of work, and leave the terminus of the flattened portion square in the corner, which cannot be done by top milling with the periphery of the cutter, and to do it with the end mill at all with the ordinary center necessitates so small and delicate a mill to escape the center, that no speed can be gained, through danger of breaking the mill.

The tail stock referred to was a regular complete stock in itself, but of course only adapted to side milling, and in this case a miller would need two different tail stocks.

I will here describe a plan I adopted, by which I use the regular tail stock, and can use it for top milling in the regular way, and also for side milling. In the drawings *A* represents the regular tail stock of the Brown & Sharpe universal milling machine. I made a casting *B* and mounted the stock on it with the side down, thus facing the top of it toward the arbor. Fig. 1 gives a rear view of the center and Fig. 2 a side view of it. A slot *b* is milled in the casting *B* to receive the edge of the stock. The casting *B* is planed with tongue to fit the slot of the milling machine, and is secured to the bed by the two bolts which are used for clamping the vise to this machine. *A* plate *d*, fastened by bolt *h*, forms a stop for the stock *A*, and bolt *e* clamps it down securely through the hole where the cone bolt is used, for fastening it to bed in the regular way. The stock is made to bear on the surface *f* and at *g* in the bottom of the slot *b* and the bolt *e*. Drawing the head down clamps it solidly without any rocking.



Milling Machine Tail Center.

To get this stock in true alignment with the head, I first face off the side of the tail stock with a large facing mill, then the edge at *g* and the surface at *e*; this is done when in its regular position. After this I find out the exact measurement from the center to the face *f*, and again from the center line at right angle to the base to the edge *g*, and from center to bottom of base of the stock. To mill the edge of slot *i* the correct distance, I set the edge on the mill even with the center of the head stock, then with the micrometer graduation around the cross feed screw I measure off the exact distance to finish the edge, agreeing with the measurement of the height of stock. For milling the bottom correctly, I set the bottom or periphery of the mill exactly the same height as center of head stock, and measure with the micrometer scale on the vertical screw the amount as before found to be, so also I do with reference to surface *f*. The surface where the bolt passes through is relieved as shown, and for the purpose before stated. The slot *b* is faced at *c* after *i* is correctly milled to fit the edge of stock. By this method a correctly aligned tail stock is produced, and a convenience gained without going to the expense of fitting up another complete head stock for this purpose. No extra holes are necessary and the stock is not marred when in use in the regular way.

* The article referred to will be found in our issue of Sept. 20th, 1884.—Ed.

LETTERS FROM PRACTICAL MEN.

Give the Belts a Rest.

Editor American Machinist:

Some one stated some time since in your paper that it was considered by some mechanics good practice to give the belts a rest. One of the first lessons taught an apprentice of my acquaintance by his father, a thorough mechanic reared in the New England States, and polished by the rounds of some of the best shops then in the country, was to give the belts a rest. Very well do I remember this lad. Necessity compelled him to begin very early in life, and his first morning at the lathe, squaring nuts or some such work, showed that he was too short for the lathe. It was necessary to prop him up, as it were. I can see that old hemlock platform as I write, with the little earnest worker ever busy, and when the whistle sounded the two welcome screeches of the day at twelve and six o'clock, off came the belt from the cones for a rest and time to prepare itself for another run, and so the belts kindly treated proved to be good belts, or at least willing belts; they were never kickers, continually tearing themselves asunder in their rush and the unfairness of their master; but, like a well fed and kindly cared for horse, performed an amount of service almost incredible. F. H. Van Houten.

Another Long Line Shaft.

Editor American Machinist:

In your issue of September 1st is the statement that the 900 feet of shafting at the Centennial Exposition at Cincinnati was said to be the longest continuous line of shafting ever run in this country. It is considerably short of one of the longest lines of shafting run at the Cotton Centennial Exposition at New Orleans, in the year 1884–85, which was 1,125 feet in one continuous length, 6″ in diameter at the middle, reducing down to 5″, 4″, 3″, and finally to 2½″ at the ends. For prudential reasons we placed universal couplings at about every 100 feet, as the nature of the soil did not justify us in risking the use of rigid couplings throughout.

The visitors to the exposition who were present on the opening day will remember the line of shafting driven by the large Harris-Corliss engine, which President Arthur started telegraphically from Washington, as, for reasons unknown to me, he could not attend in person, according to invitation. I would add that the shortest line of shafting in the machinery department belonging to the exposition was 1,075 feet long; the two lines of shafting in the annex were about 300 feet long each. The longest line was originally intended to be 1,378 feet—the whole length of the building; but on account of the large water tank, and reservoir and refrigerators, we had to reduce the length to 1,125 feet, as before stated. A. C. Dupas.

New Orleans, La.

The Immigration Question.

By Rudolph Peter, M. E.

I have read with great interest your article on the question of immigration, and as I am pretty well acquainted with the subject from personal observation and experience, I should like to offer a few remarks. It is actually true that a great many of the people who come over here from the old country do so under the idea that they will be much better off generally over here, and whatever has ailed them at home, they are not likely to meet again in this country. Generally they find, after they have been here for some time, that a great many things which they had at home, and to which they have become accustomed from childhood, cannot be had in this country, while they are expected to appreciate other things, the want of which they do not yet feel. There is, for instance, the question of the self-government of the people, which is carried out to a far greater extent in the old country than it is here. In Switzerland, for instance, the citizens of each village or town are called together once or twice a year, when the city council lays before them their propositions, to be accepted or rejected by a majority of the votes of the citizens. Over here they have no voice whatever, and are merely expected to obey orders.

The aims and expectations of people coming over here are, of course, greatly varied, and while some expect to get larger wages and to save money, so that they may finally spend the evening of their days in repose from their labor, others are only satisfied with making a fortune. The former seems to be especially true of the Italians; at least this is the opinion of them in the Argentine Republic, where it is said that, as soon as they have saved 20,000 francs, they will return to Italy to live on the income of their capital. But the majority of the immigrants are desirous of making for themselves a home of their own and an independent existence. It makes little difference to the wage-working people whether they are ruled by a Kaiser, King, or President, as they do not feel their ruling half as much as they do feel the ruling of the people they have to work for. It is even said that the rich live easier with a republican government, while the poor live easier with monarchial institutions. In the majority of cases the means of people coming over here are not sufficient to start them in any business of their own, and they must expect to work for wages until they can save enough to make a start, which, after awhile, they find mostly impossible.

The only avenue through which an immigrant can arrive at the desired goal of comparative independence and of an assured existence for himself and descendants, and where he can be made a desirable factor in the community, is the pursuit of agriculture. To start requires money, a strong will and a strong arm.

There are instances where a government, desirous of developing the resources of a new country, and probably from similar considerations, has extended a helping hand to intending settlers. The Government of Australia advertised at one period in the newspapers of Switzerland that free passage, free land and financial aid would be given to any fit person wishing to engage in agriculture in Australia. The Government of England held out the same inducements to families wishing to emigrate to the Cape of Good Hope, South Africa.

The Government of Chili promised to settlers free land in Araukania, the tools necessary, cattle and seed, and a one year's credit for all the necessaries of life, with a provision that such advances should be refunded in easy payments. Similar precedents might be obtained from the Argentine Republic. If we look back through history we find that the establishment of penal colonies has often led to vigorous growth of whole countries. A striking example of this may be found in the Roman empire, and it may also be said that the success of their colonies is to be attributed to the fact that they respected the customs, religions and peculiar institutions of the various nations subject to

their rule. A solution of the problem of immigration may be brought about by similar means. The landing of an immigrant may be made conditional on the possession of a certain sum of money, or on his agreement to take up a piece of land under the inducements offered by the government.

There is no doubt that all would not succeed, but even then, the labor done by them on their land is not lost, except to the one who has done it, while his successor would profit by it. The tools, implements, etc., furnished to immigrants might be made after the style of equipments furnished to the regular army, making them unsalable. The stability and prosperity of a great country has as a base its agriculture, while manufacturing and commerce are more dependent on the former. The stability of trade will also increase with the number of consumers not directly engaged in manufacture. As long as the great bulk of manufactured goods must be bought by those who are engaged in making them, times of panic are inevitable.

If such an offer was extended by the Government of the United States there is no doubt that thousands of laborers already in this country would also avail themselves of it; it would, in fact, be a safeguard against the spreading of anarchism, and an opportunity for those who are willing and able to succeed, but who can now find no outlet. It might also be a wise policy to do this now, and before it becomes necessary to do it as an establishment of penal colonies.

The Crosby Wire Rope Clip.

This clip is designed to squeeze the two parts of the rope together with the U bolt. At the same time the rope is flattened a little, causing strong friction on the casting, the bottom of which is corrugated to obtain a stronger grip. The U bolt indents the rope slightly, which gives it a powerful holding grip, and being near the end of the rope does no damage.

The device is very simple, and is easily applied. It is manufactured by the American Manufacturing Company, St. Paul, Minn.

Cooke Locomotive and Machine Co.

The Cooke Locomotive and Machine Company have concluded to remove their works from their present location in Paterson, N. J., to the outskirts of the same city. The cause of the removal is to obtain a more favorable site situated close to a railroad, and also to obtain sufficient ground to enable them to enlarge the works to meet the demand of their constantly increasing business. The new works will be located at the west side of the New York, Lake Erie & Western R. R., and about midway between the Paterson and Lake View Railroad depots. Here they have commenced to build the machine, erecting, blacksmith and hammer shop, and also the boiler house. The boiler shop and foundry are to be built next spring. The aim of the company is to have, when the works are completed, one of the best equipped locomotive and machine establishments in the country. The present locations of the different departments of these works are such as will enable the company, at any future time, to enlarge each department without interfering with that system of handling material and erection of machinery as their past experience has taught them to establish.

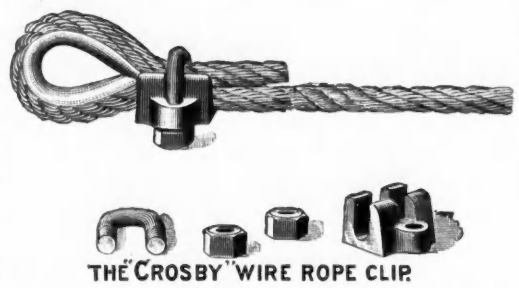
Besides their large locomotive business, the company is also engaged in the manufacture of high speed automatic engines, in all sizes suited to electric systems. The design of these engines is the invention of Jas. T. Halsey, whose aim has been to bring out a balanced slide valve engine having a minimum clearance, perfect regulation, and a guaranteed highest duty in fuel economy, from 15 per cent. of load to full load. In the Edison electric light station in Paterson, five engines are used, four of which are Halsey's engine recently furnished by the Cooke Locomotive and Machine Company. Two of these engines have $14'' \times 16''$ cylinders and are rated at 150 horse-power; the other two engines have $9'' \times 12''$ cylinders and are rated at 50 horse-power. We are informed that these engines, have so far, given excellent satisfaction.

Manganese Steel.

In a paper on manganese steel, read before The Iron and Steel Institute at Edinburgh, by B. A. Hadfield, is the following:

Another important use of this material, and one which led to the commencement of these experiments, is its application as a hard material for car and other wheels, to compete with those made of chilled iron in America and elsewhere. The difficulty was at once met with that, if the wheel was cast in one piece, although exceedingly tough, it is hard to the tool throughout, and it is impracticable to bore out the boss. Attempts were made to cast, in the boss, soft steel or iron bushes, but this was generally unsuccessful, owing to the contraction splitting the boss when cooling. A more successful method has been that of casting the wheel in two parts, then bolting or otherwise fastening them together; or that of casting in the hard tire wrought-iron or soft steel arms, onto which an ordinary soft steel boss could be afterwards bored, was cast. In either of these cases the tires are readily trued or ground up, as practiced in America. Wheels of this class have been used with satisfactory results. On the Nottingham tramways, a set ran over 30,000 miles under severe conditions, the gradients averaging as much as 1 in 18 for about one-half the route of the daily journey. In this case, a peculiar point was noticed, viz., that whereas the cast-iron wheels are liable to slip when going down an incline, the chilled brake-blocks bite much more effectively on manganese wheels, enabling the car to be stopped sooner. The Chester Tramways Company has had a set running for over two years, which up till now have run over 45,000 miles, and are not yet worn out. Wheels of this description can be tested with more than one hundred blows with a heavy sledge hammer without fracture occurring, and at the same time the tire is so hard that a chisel will not touch it.

The following method of burnishing iron and steel by means of the electric current was recently communicated to the International Electric Society of Paris by M. A. de Meritens. The metal to be covered is placed in a bath of water at about 170 degrees Fahr. and is connected to a source of electricity just strong enough to decompose the water. Under these conditions the plate becomes coated with a layer of the magnetic oxide, which is firmly adherent and which will take a high polish. If too strong a current is employed, the layer of oxide will not adhere to the metal.



THE "CROSBY" WIRE ROPE CLIP.

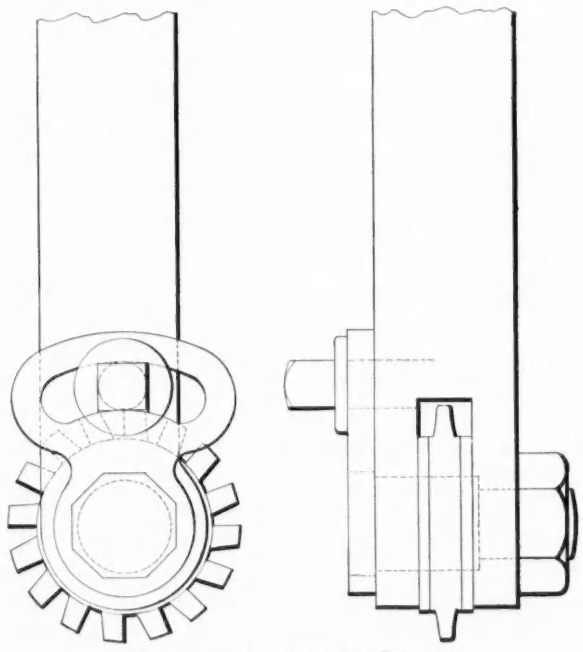
A Device for Cutting Racks.

There are a good many machine shops in which considerable rack-cutting must be done, and yet in which it will scarcely pay to procure a regular rack cutter. In such shops it is customary to file tools to the proper shape for cutting the teeth, by the use of templets, for use in the planer or shaper; a plan which is conceded to be open to serious objections; since, for various reasons well understood, neither the tool nor the templet by which it is filed is likely to be very accurately formed, in most shops, and it is quite an expensive method at best.

A much better method is shown by the cuts on this page, the credit for which is due to Mr. Jas. H. Ferguson, of New York.

It consists of a square bar which is held in the planer or shaper, the same as an ordinary tool. The end is adapted to receive an arbor upon which is a Brown & Sharpe rack cutter, held securely by a key in the usual manner. There is a collar or head upon this arbor, which is milled octagonal in shape, and to this is fitted a piece having a circular slot which admits of its being moved something more than one-eighth of a revolution and clamped in any desired position.

The object of this feature is to enable any tooth of the cutter to be brought to the proper position for cutting. The arbor can be turned one-eighth of a revolution by raising the slotted piece sufficiently to clear the head, and can then be adjusted to any desired position within this eighth of a revolution by means of the slot.



DEVICE FOR CUTTING RACKS.

The many advantages of such a tool must at once be apparent. It will always be accurate in shape; a number of cutting edges can be ground at one time; grinding can be done without changing its shape; and finally, it is not only better in every way than filing tools to shape, but is much more economical. The Brown & Sharpe patent cutter is peculiarly adapted to it, on account of the comparatively coarse pitch of the teeth, and the facility with which they can be sharpened.

There is at present being built by Mr. W. S. Cumming, Parkhead, Glasgow, for Glasgow Harbor cross-river traffic, a passenger ferryboat, which in design is a decided improvement upon the boats at present in use. The craft is double-ended, is entirely built of Siemens steel with heavy scantlings, and is divided into five water-tight compartments by four steel bulkheads. Even with any two of these compartments flooded the craft would float. The deck, seats, and the inside panels of the bulkwarks are of teak. The propelling engines are of the vertical high-pressure type, with two cylinders 7 in. in diameter and 8 in. stroke, working at 100 lb. pressure and driving twin propellers, one being placed at each end of the vessel. The boiler is vertical. The present boats have engines of the diagonal type working at eighty lb. pressure. One of Drysdale's patent pumps is also fitted in the new vessel for use in the event of fires taking place in the harbor, and gearing is fitted to the engines to admit of their being disconnected from the propellers and employed in driving the fire pump when required. A supply of hose for salvage purposes is also kept on board, to be employed in drawing water from sinking vessels or from vessels after a fire. The deck arrangement and steering apparatus are much better in the new than in the old vessel. In the latter the boiler space is an open pit, and the rudder at either end is controlled by a wheel placed horizontally and working gearing under the deck. This wheel too is in the center of the space where passengers embark and disembark. In the new craft there is constructed round the boiler space and engine room a steel casing 3 ft. high. Above the engines is a skylight. At the end of this casing is a platform raised 2 ft. above the deck, from which the movements of the vessel are controlled by gearing acting on both rudders simultaneously, thereby doubling the steering power of the vessel. From the same platform the engine is controlled, and also the gearing for working the pumps, so that the vessel is placed entirely under the charge of one man.—*Engineering.*

The subject of water communication is still receiving a great deal of consideration in England. The railway charges for freight between points not connected by waterways are held to be exorbitant, and water communication is believed to be the only way of checking the greed of the railway corporations. There does not appear to be much difference in this respect between England and the United States, as any one having occasion to ship goods between New York and points up the Hudson river in summer and winter has learned by practical experience. The waterways should be preserved and improved by all means.

The trial of the guns of the cruiser Boston seems to have resulted satisfactorily to the experts who were detailed to observe them. The means for preventing disastrous recoil are said to have been all that was desired, and in other respects everything worked smoothly. It may now be expected that this cruiser will soon be put in service. The Boston is 3,189 tons displacement, and carries twelve breech-loading guns, besides nine Gatling guns, and other rapid firing small guns.

The high pressure demanded for triple and quadruple expansion engines is bringing out in England the uncertainty of brazed copper pipe, and efforts are being made to produce pipe without brazing, by an electro process. This is undoubtedly a move in the right direction.

The cost of carrying a bushel of wheat from Chicago to New York in 1870 was: By lake and canal, 17.10 cents; by lake and rail, 22 cents; all rail, 33.3 cents. In 1887, by lake and canal, 8.21 cents; by lake and rail, 12 cents; all rail, 16.3 cents.

Engineering, referring to the rates charged for transporting freight by railroads in the United States, says: "We know nothing of such low rates in this country." There seems to be a very general belief in England that the freight rates charged by railways are excessive.

The steamship City of New York is said to have burned 290 tons of coal a day, when running at three-quarters speed. If this is so she will need a tender to carry her coal when steaming at full speed.

AMERICAN MACHINIST

To prevent delays all Communications should be addressed to the Company.

PUBLISHED WEEKLY
BY
American Machinist Publishing Co.
96 Fulton Street, New York.

HORACE B. MILLER, Pres't and Bus. Manager.
LYCURGUS B. MOORE, Treas. and Sec'y.

F. F. HEMENWAY, Editor and Mech. Engineer.
J. G. A. MEYER, } Associates.
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$3.50 a year to Other Countries, postage prepaid.

Advertising.

Transient, 35c. per line, each insertion.
"Business Specials," 50c. a line.

The American News Company,
Publishers' Agents, New York.
The International News Company,
11 BOUVERIE STREET, Fleet Street, LONDON, ENG., will receive subscriptions for the AMERICAN MACHINIST, at 14/7 per annum, postage paid.

DEALERS SUPPLIED BY

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NEW YORK, SEPTEMBER 22, 1888.

CONTENTS.

	PAGE
A New Lathe Chuck	1
Practical Drawing. By J. G. A. Meyer. Fifty-ninth Paper	1, 2
About the Hobbies of Machinists. By Frank H. Richards	2, 3
Thirty-six Inch Back Geared Power Feed Drill	3
National Electric Light Association	3
Notes on the Expansion of Steam. By Richard H. Buel. Tenth Paper	4
Circumventing a Railroad	4
The Influence of Aluminum Upon Cast-Iron	4, 5
Measuring Screws—Shape of Screw Thread Affected by Angle. By Jarno. First Paper	5
English and American Locomotive Practice. By W. H. Booth. Fifth Paper	5, 6
Letters from Practical Men: Give the Belts a Rest. By F. H. Van Houten—Another Long Line Shaft. By A. C. Dupas	6
The Immigration Question. By Rudolph Peter, M. E.	6, 7
The Crosby Wire Rope Clip	7
Cooke Locomotive and Machine Co.	7
Manganese Steel	7
A Device for Cutting Racks	7
Old Tools	8
The Twin Screw Principle Not Yet Proven a Failure	8
Government Shops and Yards	8
Newspapers as Law-Breakers	8
Literary Notes	9
Questions and Answers	9
Manufactures	9
Machinists' Supplies and Iron	10

Old Tools.

It used to be quite common practice for parties starting without much capital to build up a machine shop business to buy second-hand tools—cheap ones at that. It is extremely hard to get up to success in that way now. The difference between good and poor tools is too great at the present time, and with the worn-out relics of former days there is little hopes of competing with well-equipped shops. The man who tries it is likely to grow poorer from year to year, instead of working up slowly to where he can afford to buy good tools. It is better to start more moderately; to start with fewer and better tools. This has come to be pretty generally understood and practiced.

But there are a good many old shops in the country, at one time—for the times—fairly equipped, that are slowly going to decay through using their ancient tools and appliances. There has been a great advance in machine tools during the past twenty years, not only with reference to the quality of the work that can be done with them, but, and particularly, with reference to the quantity. Then when these old, weak tools, worn out with use, are put against modern tools in another shop, there is little hope of competing. The more modernly equipped shop would find all the profit it ought to make in the extra work that could be done on the modern tools.

Then, modern shops generally have better appliances for handling work, and this tells in their favor. Whatever in the old shop keeps the old tools in service is very likely to keep out modern cranes and other means of handling work.

It takes a constant spirit of progressiveness to keep a machine shop up to the times in the way of tools. And unless this is done the shop soon becomes "old." And the character of the tools in a shop is very likely to be reflected in the men. Good mechanics like to work with good tools, and are very likely to go where they can find them. A man who expects to spend the best part of his time in a shop will, if he is the right kind of a man, want his surroundings reasonably pleasant. Altogether, the old shop, with the old tools, is in a bad way. But it is not beyond redemption. New tools were never so cheap as at present, and they will go right along paying for themselves. Cranes and labor-saving appliances, with good tools, will make the old shop a new one.

The trouble with getting rid of old tools appears to be that they stand something in the relation of old friends. Whoever heard of an old lathe or planer being put through the cupola—where it would do the most good.

The Twin-Screw Principle Not Yet Proven a Failure.

The news comes across the ocean that the new twin-screw steamer, the City of New York, will be unable to sail for this port on the 5th of September, as advertised, and for the reason that the first trip, and return, has shown that the vibrations caused by the working of her two powerful engines are too severe, and the inference is that some changes are to be made before another trip is attempted. There were, before the first trip was made, plenty who argued that twin-screw steamers would not prove to possess any advantages over the single-screw vessels, and this failure to gain complete success in the first trip of the first passenger vessel has, to their thinking, strengthened their position.

We think, however, that scarcely any one who has watched the development of any new principle applied to engineering matters will conclude that the twin-screw principle is a failure upon so slight a basis for judgment.

The machinery of the City of New York is yet in the hands of the builders, not to be accepted until she has made a number of trips and proven satisfactory, and that she cannot be made satisfactory is by no means yet proven.

The builders are no novices in the art, and probably know as well as any one that the development of any such thing is a tentative process; that the first trial, while it is not at all certain, or even likely, to result in complete success, shows the reasons for the failure to attain that success, and indicates the proper modifications.

Then in forming a judgment of the performance of any vessel embodying a new principle, it should be remembered that the standard of efficiency with which she must be compared is very high, and that that standard has been attained by a gradual growth, a continuous improvement upon some previous attainment; and we can depend upon it that those who have faith in the twin-screw principle as applied to passenger steamships will not be discouraged to the extent of preventing them from making further effort on account of the incomplete success of the first trip of the first vessel, but that they will persevere through many trips of as many vessels as may be needed to fully demonstrate the value of the principle, as applied to trans-Atlantic steamships of large size. Twin screws have been used for years on other classes of vessels, and have done very well indeed. It should now be demonstrated whether or not they are the best for such vessels as the City of New York, and the partial or even complete failure of the first trip of the first vessel of the kind by no means proves that success cannot eventually be attained.

Government Shops and Yards.

One hundred and fifty men were recently discharged from the Brooklyn Navy Yard. The men wanted work, and the Government had urgent need of their services, but the appropriation had been used up, and there was no money left with which to pay wages.

There could be nothing more unbusiness-like than the way in which the Government shops and yards are run in this respect. What would be thought of a private firm with more ready money than it knew what to do with, that shut up shop two or three times a year because suitable appropriations had not been made for carrying on the work? A firm trying to do business in this way would lose all its best workmen, and soon go into bankruptcy. But this is exactly the way Government yards and shops are run.

A good deal of sport is had at the expense of the workmen in these yards and shops, that is as to their unquestioned ability to get along without doing much work. It need never be expected that a very energetic class of workmen will be likely to stop in shops where the fashion is to lay them off or discharge them outright for no good and sufficient cause. There is no reason why the Government should not get and keep as good mechanics as there are in the country, and get just as much work from them as a private firm gets, if it will pursue the same course in regard to managing its business. As long as men are hired through some political influence, and such men at that as are willing to work in the expectation of being discharged as often as Congress, for political reasons, cuts down or delays the appropriations for work, it is foolish to look for anything better than at present.

If somehow a little common sense could be injected into the powers that appropriate money to carry on the mechanical work of the Government, it would save a good deal of money to the people. It is really no wonder that it costs two or three times as much to do work in Government yards and shops as it does in those managed by private individuals.

Newspapers as Law-Breakers.

The new law of New York, substituting an electric shock for the rope in the execution of criminals, also forbids the publication by the newspapers of the details of the execution, the mere official announcement that capital punishment has been inflicted on a certain man at a certain time and place being all that is allowed; anything further than that making the editor who publishes it liable to imprisonment.

During the discussion of this law by the legislature, and by the public press, last winter, when it was enacted, we failed to notice any condemnation of this provision, and, so far as we have noticed, no paper published in New York has found any fault with it. The public had welcomed it as a probable deliverance from the disgusting details and beastly cuts illustrating such events, hawked about the streets, in some cases before the execution, in the anxiety of each publisher to "scoop" the others.

A reporter interviewed the managing editors of seven prominent, if not the leading, daily papers of the city on the subject a few days ago, the result being published in the *Mail and Express*. They were unanimous in the declaration that they would publish the full details of every execution, the law to the contrary notwithstanding, the general sentiment seeming to be that they were in the business of selling news to the public; that they would go to any pains to secure that news; that imprisonment for publishing news would be considered an honorable distinction; one of them saying: "That law is sure to be violated, whatever the consequences may be." Another: "It is a law to be broken," etc.

Here we have the spectacle of the leading newspapers of a great city, aiming to mould public opinion, and to be the educators of the masses, making of themselves deliberate and intentional law-breakers, and boasting of it.

How does this agree with their teaching of others, that above all things else in this country we must have full respect for law? Many of the papers mentioned are most prominent in their denunciation of others who have broken the laws, even though they do so under the influence of very strong temptation and with no deliberate intention of so doing, and they are especially vigorous in their denunciation of law-breakers if they be poor and without influence.

It seems to us that high and mighty editorials condemning some thoughtless or unintentional infraction of law, committed perhaps under the promptings of hunger or a sense of gross injustice, and aiming to teach the supreme importance to the safety of our republican institutions of a reverence for law and constituted authorities, will come with poor grace from any of those papers hereafter.

We have received from the International Brotherhood of Machinery Moulders a beautifully engrossed and artistically framed preamble and resolution thanking the AMERICAN MACHINIST for favors extended in assisting their president in establishing the *Journal* of the Brotherhood. Modesty prevents us from publishing the preamble and resolution, but we appreciate the good feeling just the same. As we have before said, we wish the Brotherhood and its *Journal* every success, and are more than pleased to have been of assistance.

According to Dr. Tanner, of Boston, a paper from whom is published by *The Sanitarian*, tests for the purity of drinking water are worthless. He says the chemical processes relied upon are "as apt to condemn a good water as they are to commend it, and to commend an impure water as they are to condemn it." If five per cent. of milk or beef extract were added to pure water, the processes will condemn it as impure, on account of the presence of organic matter, but a few million of disease germs may be added to a gallon of distilled water, and none of the processes will lead to their discovery, because the quantity of organic matter is not large enough. He cites instances where water purposely contaminated had been proved, by the processes, to be remarkably pure. If Dr. Tanner is right, his conclusions are startling, as the processes which he says often give results quite contrary, one to the other, are those upon which almost absolute reliance has been placed.

The Naval Appropriation bill, agreed upon by the Senate and House, provides for the building of two steel cruisers of 3,000 tons displacement, to cost, exclusive of armament, not more than $1,100,000 each; one

steel cruiser of 5,300 tons displacement, to cost not more than $1,800,000 and three gunboats of not more than 2,000 tons displacement, and to cost not more than $700,000 each, unless the additional cost is in the way of premium for increased speed. Provision is to be made in the contracts for the first-named cruisers that they must steam at a speed of at least nineteen knots an hour, and the larger cruiser must show a speed of at least 20 knots. A premium of $50,000 will be paid for each quarter-knot of speed over that stipulated, and the same sum will be deducted for each quarter-knot failure to reach that speed.

Literary Notes.

We have received Vol. 6, No. 4, of *Proceedings of the Engineers' Club, of Philadelphia*, together with a supplement containing a list of members for March, 1888. The number contains President Cleemann's retiring address, and President Wilson's opening address, papers read before the club, abstracts of minutes of meetings, etc.

Our enterprising contemporary *Light, Heat and Power* has changed from a monthly to a weekly. As heretofore, it will devote itself to the interests of gas. We wish it a full measure of success in its new departure.

Questions and Answers.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common-sense methods.

Every question, to insure any attention, must invariably be accompanied by the writer's name and address. If so requested, neither name, correct initials nor location will be published.

(417) W. T., Syracuse, N. Y., asks: How many square inches are there in a 2-inch safety valve, and what will the pressure on the valve be, the boiler pressure being 60 pounds? *A.*—The area of a 2-inch circle is 3.14 inches. This multiplied by 60 gives 188.4—say 188½ pounds' pressure operating to lift the valve.

(418) G. W. W., Verdon, Brown Co., D. T., asks: Why does the boiler on a threshing machine foam when using the injector, and not when using the crosshead pump? I have used five different styles and find them about the same. *A.*—The probable cause is that the injector feeds faster than the crosshead pump, and that in using the injector you allow the water in the boiler to rise to a higher level than the crosshead pump can maintain, and thereby cause the boiler to prime.

(419) A. B. C., ———, asks: 1. In designing a boiler to carry 150 pounds steam, how much anthracite and bituminous coal would you allow per square foot of grate surface per hour, and how many pounds per indicated horse-power? *A.*—In ordinary practice you can allow 12 pounds anthracite and about 16 pounds bituminous coal, with natural draft. 2. In a triple expansion engine, what is considered a fair allowance of water consumption per indicated horse-power? *A.*—Fourteen to twenty pounds, according to conditions; in some cases less.

(420) J. M. S., Benwood, W. V., writes: The opening in the safety valve is 4 inches, the safety valve weight 200 pounds, the lever and valve weigh 160 pounds, the pressure is 160 pounds; what should be the distance between the safety valve weight and the fulcrum? *A.*—You must give us the weight of the lever separately, and also state whether the lever is of uniform thickness and width throughout; if the lever is smaller at one end than at the other we must have the dimensions of the lever, otherwise we cannot give you the correct position of the safety valve weight.

(421) F. T., Cairo, Ill., asks: Which will develop the most power, a single engine 15¼" x 17", or two engines 12" x 12" coupled at right angles, all other conditions being equal? *A.*—If in both cases the revolutions per minute are the same, then the single engine will develop the most power, because of the greater piston speed; if in both cases the piston speed is the same, the coupled engines will develop the most power, because the combined area of two 12-inch cylinders is greater than the area of one 15¼-inch cylinder.

(422) H. J. B., Calumet, Mich, writes: Please refer me to books treating on the marine engine. I would like a book explaining the marine engine in as practical form as possible, giving all necessary rules, formulas, etc. *A.*—There are several books published treating on this subject, but which one will suit you best, is difficult for us to say. We would advise you to write to any good publisher of scientific works for a catalogue, and make your own selection. If you are near any good public library, it will be well for you to examine the books before you buy them.

(423) M. S., St. Paul, Minn., writes: About how large a fan will it take running at 200 revolutions per minute to change the air in 800 cubic feet of space every five minutes? How large should the discharge pipe be? The air is to be used for heating and ventilation. Also what fraction of a horse-power will it require to drive the fan, disregarding friction? The fan is to be driven by a rope. What size pulley and rope will it require? *A.*—The answers to these questions will depend on the kind of fan you use. We would advise you to write to the manufacturer of the fan; he will give you all the desired information, and also guarantee that which is claimed for the fan, thereby avoiding disappointment and an unnecessary expense which may be incurred by adopting a fan not suitable for your purpose.

Business Specials

Transient Advertisements 50 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday for the ensuing week's issue.

See Grant's Gear advt. on back page.

Link-Belting.

Send for Catalogue of Link-Belting.

Over 50,000,000 feet of Link-Belt in use.

Link-Belt Machinery Co., Chicago and N. Y.

See our new designed engine lathes in Cincinnati Centennial Exposition, Lodge, Davis & Co.

See our new designed drill presses in Cincinnati Centennial Exposition, Lodge, Davis & Co.

See our new designed shapers in Cincinnati Centennial Exposition, Lodge, Davis & Co.

See our new designed brass working tools in Cincinnati Centennial Exposition, Lodge, Davis & Co.

2,000 feet of space in Cincinnati Centennial Exposition, Lodge, Davis & Co.

See special adv't, page 16, Lodge, Davis & Co.

Shafting Straighteners. J. H. Wells, Tampa, Fla.

Steel Name Stamps, etc. J. B. Roney, Lynn, Mass.

Lamb Knitting Machine Co., Chicopee Falls, Mass.

Machine work and pattern making. Anderson Machine Works, Peekskill, N. Y.

The Best Upright Hammers run by belt are made by W. P. Duncan & Co., Bellefonte, Pa.

Light articles built to order by the American Sewing Machine Co., Philadelphia, Pa.

Drop presses, punches and shears. Williams, White & Co., Moline, Ill., manufacturers.

R. Dudgeon, 24 Columbia st., New York. Improved Hydraulic Jacks and Roller Tube Expanders.

Pattern and Brand Letters. Vanderburgh, Wells & Co., cor. Fulton and Dutch sts., New York.

"Swift" Sight-feed Lubricator; no glass tubes; simple, reliable. Swift Lub'r Co., Elmira, N. Y.

Davis Key-Seating Machines, kept in stock by Manning, Maxwell & Moore, 111 Liberty st., N. Y.

Mechanical drawing, calculations, etc., taught by correspondence. I. Donald Boyer, Dayton, Ohio.

"Bradley's Power Hammers, the best in the world." 20 sizes. Bradley & Co., Syracuse, N. Y.

Drawings, mach. patterns and models. Inventors' ideas perfected. Valentine, 15 Alling st., Newark, N.J.

Selden Packing, for stuffing-box, with or without rubber core. Randolph Brandt, 38 Cortlandt st., N.Y.

Brown & Sharpe Mfg. Co. have a line of machinery with S. A. Smith, 23 S. Canal st., Chicago, Ill.

Patents—Whittlesey & Wright, 705 8th st., N. W., Washington, D.C. Send for pamphlet and references.

Ice and Refrigerating Machines, 124 built, and all successful. David Boyle, 521 Monroe st., Chicago, Ill.

For the latest improved Diamond Prospecting Drill, address the M. C. Bullock Mfg. Co., 138 Jackson st., Chicago, Ill.

Engine lathes, hand lathes, fine tools, files and supplies for machinists and other metal workers. Frasse & Co., 92 Park Row, N. Y.

Patent Attorney. R. G. DuBois, 916 F. st., Washington, D. C. Service at reasonable rates. Send for pamphlet containing list of references.

If you visit the Ohio Centennial at Cincinnati, see the Waterhouse Arc Light Plant. W. N. Gray, agent, 56 Longworth st., Cincinnati, Ohio.

Machinists supplies, brass goods, m't'rs supplies, polishing materials, all kinds wire, metals, etc., in any quantity. Jordan & Gottfried, 208 Canal st., N Y.

For Best Return Steam Traps, Pressure Regulators, Positive-Acting Pump Govs., Back-Pressure Valves. T. Kieley, 11 W. 13th st., N. Y. Send for des'n.

Fine tools and supplies for machinists and other metalworkers. Get our prices before purchasing elsewhere. Montgomery & Co., 105 Fulton st., N. Y. City.

Curtis Pressure Regulators. Curtis Return Trap. Curtis Damper Regulator. See Sept. 1, p. 12. Send for circular No. 17. Curtis Reg. Co., Boston, Mass.

Upright drills, improved, sizes 21", 23", 25", 28", 32", 36" swing; finely made and great capacity; write for cuts and prices. Currier & Snyder, Worcester, Mass.

W. H. Hoffman, consulting engineer, 108 Liberty st., room 3, N. Y. Mechanical engineering in all its branches; working drawings for the transmission of power by steam, water, air and electricity.

Contract work of all kinds executed promptly and on reasonable terms. Parties wishing gray iron castings in large quantities can make money by corresponding with Rawson Mfg. Co., Hornellsville, N.Y.

Wanted—A mechanic in every shop in the world to act as agent. No interference with regular work; no capital required; free samples and good commission. Send for samples and particulars to F. N. Carter, 176 St. Clair st., Cleveland, O.

A system of easy lettering by J. H. Cromwell, giving 26 forms of alphabets. The space to be lettered being divided into squares; simple and effective. Price 50 cents. Calalogue of books for engineers free. E. & F. N. Spon, 12 Cortlandt st., N. Y.

"Indicator Practice and Steam Engine Economy." By F. F. Hemenway. Contains plain directions for using the indicator, and making all required calculations from the diagram; also the principles of economy in operating steam engines, and current practice in testing engines and boilers. Price $2, postpaid. Published by John Wiley & Sons, 15 Astor Place, New York.

"Binders" for the AMERICAN MACHINIST. Two styles, the "Common Sense," as heretofore sold by us, and mailed to any address at $1.00 each, and the "New Handy," mailed at 50c. each. The former has stiff board covers, while the latter has flexible covers, with full page opening flat. Either will hold the entire 52 issues of any volume. AMERICAN MACHINIST PUB'G CO., 96 Fulton st., New York.

The series of articles by J. G. A. Meyer, on "Practical Drawing," now running in the AMERICAN MACHINIST, should be closely followed by every student. They commenced with October 23, 1886 issue, and up to and including Sept. 22, 1888 issue, 59 articles have been so far published. Copies containing these articles sent by mail to any part of this country or Canada at 5 cents each. AMERICAN MACHINIST PUBLISHING CO., 96 Fulton st., New York.

"Modern Locomotive Construction," By J. G. A. Meyer. The above series of articles, now running in the AMERICAN MACHINIST, are attracting the attention of railway mechanics all over the world. Commencing with the June 27, 1885 issue, 73 articles have thus far appeared up to and including the Sept. 15, 1888 issue. Copies containing these articles sent by mail to any part of the U. S. or Canada at 5 cents each. AMERICAN MACHINIST PUBLISHING CO., 96 Fulton st., New York.

Manufactures

J. F. Barnes will build a machine shop at Greenville, Tenn.

Garton & Donohue have opened a machine shop at Baltimore, Md.

The Somerset Woolen Mill, East Madison, Me., has been started up.

J. Barry is interested in building a large iron foundry at Athens, Ga.

Bosworth & McElwee are building a broom factory at Anniston, Ala.

W. H. Smith is building a shingle mill, to be run by steam power, at Fort Farfield, Me.

The Griffin Light and Water Company will put up an electric light plant at Griffin, Ga.

It is probable that the Indianapolis (Ind.) steel rail mill will be changed to a wire manufactory.

The Little Belle Iron Company have let the contract to build a charcoal iron furnace at Bessemer, Ala.

The Nashville, Chattanooga and St. Louis Railroad Company will build large shops at Nashville, Tenn.

The D. M. Sechler Carriage Company has nearly completed, at Moline, Ill., a large four-story brick carriage shop.

The Central Furniture Company, Saginaw, Mich., will enlarge their shops. At present they employ about 60 workmen.

Hooven, Owens & Rentschler, builders of Corliss engines, Hamilton, Ohio, are remodeling and enlarging their shops.

The Tamarack-Osceola Copper Manufacturing Company are building a mill for making copper wire at Dollar Bay, Mich.

T. J. Wood & Co. will build a three-story factory 60 x 120 feet, at Starkville, Miss. They will manufacture wagons and carriages.

The Stewart Iron Company's mill at Sharon, Pa., recently started up, after several months' idleness. Iron blooms are being made exclusively.

The Buckeye Buggy Company, whose works were destroyed by fire a few months since, is building new works, which will be finished in a few weeks.

The Milvale Construction Company has been organized, to manufacture fire escapes, shutters, etc., at Milvale Borough, Pa. Works will be erected at once.

Hill Bros. agree, if the citizens of Harmony, Me., will subscribe $10,000, to build a large wood-working establishment there, to be ready to operate before winter.

The Pennsylvania Railroad Company are to build large shops at Altoona, Pa. The shops will have a capacity to build all the locomotives required by the company.

The Magnesia Sectional Covering Company, of Philadelphia, Pa., has a contract for covering boilers, pipes, etc., of the government cruisers now building at Cramps.

W. P. Davis, North Bloomfield, N. Y., proprietor of the North Bloomfield Foundry and Machine Tool Works, closed up shops Sept. 5 to give his men two weeks' vacation.

The Perkin Lock Manufacturing Company is the name of a new Cleveland (Ohio) concern. The company proposes to manufacture locks, using a capital of $100,000.

The City of Winona, Minn., has given the Gate City Carriage Company a tract of five acres of land with 500 feet frontage on the C. & M. Railroad, upon which to build shops.

The Cleburne (Texas) Electric Light Company, capital stock, $25,000, has been chartered. Incorporators—E. M. Heath and C. W. Mexty, of Cleburne, John Adamson, Owen J. Cooke and W. J. Stork, of Fort Worth, and E. W. Naylor, of San Antonio.

The United States Rolling Stock Company, Anniston, Ala., are building an addition to their rolling mill, 100 x 210 feet. The area occupied by the mill has already been more than doubled in the last two months, and a further enlargement is now found to be necessary.

The Bessemer Iron and Steel Company are building two iron furnaces at Bessemer, Ala.

A syndicate of capitalists called the Cartersville Steel and Furnace Company will erect at Cartersville, Ga., a large furnace, to cost about $300,000. The land company at that place has donated a site for the plant.

The Bertram Manufacturing Company has been chartered to manufacture woolen and worsted goods in New York City. The trustees are Marvin F. Wood and Joseph S. Austin, of New York, and George E. Earl, of Jersey City.

We have received from Perkins & Co., Grand Rapids, Mich., an illustrated catalogue of improved shingle mill machinery made by them. They manufacture a large variety of machines, which are illustrated and described in the catalogue.

The pipe mill of the Reading (Pa.) Iron Works has resumed, after a long idleness, with 200 men, the employes having had restored to them 5 per cent. of the 10 per cent. reduction in their wages made some months ago, with a promise that the other 5 per cent. will be restored soon.

T. R. Almond, Brooklyn, N. Y., has filled his second order within a few weeks from Paris for drill chucks, turret heads and angular couplings. He has also recently filled an order for chucks from London, and the eleventh order for angular couplings from one party in this country.

The Brown & Sharpe M'f'g Co., of Providence, R. I., are now putting in another battery of Harrison safety boilers of 275 horse-power capacity. They have used this type of boiler since 1871, since which time they have given four orders, aggregating nine boilers of 665 horse-power.

New water-works, or alterations in existing works, are in view at Greeley, Col.; Central City, Neb.; Morristown, Tenn.; Tipton, Ia.; Duluth, Minn.; Baltimore, Md.; Greenfield, Ind.; Osborne, Kan.; Gladstone, Mich.; Wadena, Minn.; Abingdon, Va.; Tallahassee, Fla.; Gladwin, Mich.; Tullahoma, Tenn.; North Bend, Neb.

Messrs. Curtis & Curtis, of Bridgeport, Conn., manufacturers of the Forbes patent die stock, pipe cutting and threading machinery are still running overtime in their new works. Their July shipments were the largest they have ever before made in a single month, but they overran even this in August by over $500. They are particularly busy in filling orders for their power machines, among which we noticed orders from South Africa, Texas, Montana and San Francisco.

Among recent shipments, the Buffalo Forge Company, of Buffalo, N. Y., have sent a complete equipment of Smith's forges, steel pressure blowers and ventilating fans on their contract with the Vanderbilt University of Nashville, Tenn., and similar plants to the Miller Manual Training School, Crozet, Va.; The University of Tennessee, Knoxville; The Georgia State School of Technology, and Cornell University, Ithaca, N. Y. In addition to their extended line, they make a specialty of complete plants of this kind for technical educational institutions.

The new central station of the Boston Electric Lighting Company, on Atlantic avenue, is now under way. It will be 160 feet long by 50 feet wide. The building itself will be of brick and three stories high. The first floor will be occupied by the boilers and engines, the second by the dynamos, and the third will be used for storage purposes. There will, at first, be 52 dynamos, with a capacity of 3,000 arc lights. In addition to this, some of the dynamos are to be used to furnish power, and some are for incandescent lighting. The company have purchased the land upon which they are building, and the wharf behind it. The building will cost $100,000, and the whole location will aggregate $200,000. This does not include the fitting up of the plant.—*The Commercial Bulletin.*

The *Weekly Northwestern Miller* says: The year promises to be a most active one in the line of elevator building in this State [Kansas.] A. C. Davis, of Minneapolis, Minn., will build one at Belleville; Miller & Douglass are putting one up at Palmer; Mr. Anderson, an extensive grain dealer at Beatrice, Neb., is arranging for a house at Smith Centre, and will put up others at Kensington, Bellaire and Athol. Mr. Crouch, his business manager, is looking the matter up; Paxico will have a 10,000 bushel house, and Morganville expects one soon, size not named; Mr. Rudroe talks of building an elevator and feed mill at Oskaloosa; S. A. Foster will build one at Leonardville; the Union Grain Co., one at Woodbine; Mr. Morse, of Topeka, will likely put up a house at Horton, and Arlington also expects one.

A press dispatch says the Fall River Iron Works Company has issued a call to stockholders for a meeting to be held soon, at which it is proposed to discuss the advisability of erecting one or more cotton factories. The iron works was recently purchased by the American Printing Company, and reorganized as a separate corporation, though both concerns are virtually one and the same. At the time of the sale it was understood that the print works wanted control of certain valuable water privileges owned by the Iron Works Company, and nothing has since been done to improve the latter property. Other real estate was also bought in by the American Company, and it is now evident that the print works intends to supply itself with a portion of the cloth which it uses. The company prints 33,000 pieces weekly, and the four cent market for cloth in the gray has been eating into profits.

Gas works are to be built at Alexandria, Va., and Decatnr, Ala.

Cushman & Co., Auburn, Me., propose to run their shoe factory with an electric motor.

The Kansas City (Mo.) Light, Power and Heat Company contemplate putting up four electric light plants.

H. Gauss & Sons are rebuilding their extensive planing mill, sash, door and box factory at St. Louis, which was burned down three weeks ago.

The Thomson-Houston Electric Company, New York, have contracted to furnish a 100 light plant to San Jose, the capital of Costa Rica, Central America.

The Cleveland (Ohio) Twist Drill Company expect to get into their new shops about Nov. 1. Their principal shop is 40 x 100 feet, with additions for forge shop, etc.

The shoe manufacturers of Lynn, Mass., are agitating the question of making their own boxes, both wood and paper. The cause is the advance of prices brought about by the combination of the box makers.

The Hill Automatic Sprinkler Company, Columbus, Ga., inform us that they are rapidly introducing their automatic sprinklers in the South. They have them in 30 mills, and others are considering their use. The endorsement of these sprinklers by insurance companies is making an increasing demand for them.

Machinists' Supplies and Iron.

NEW YORK, Sept. 13, 1888.

Iron—American Pig—In the West the demand for all kinds of material has been more active recently, which has resulted in a better feeling in the iron market, though there has as yet been no important increase in the volume of business transacted in this market. We quote Standard Lehigh and North River brands $17.50 to $18.50 for No. 1 X Foundry; $16.50 to $17 for No. 2, and $15 to $16 for Grey Forge.

Scotch Pig—We quote Gartsherrie, $19.75 to $20; Summerlee, $19.25 to $19.50; Eglinton, $17.50 to $17.75; Langloan, $19 to $19.50; Dalmellington, $18 to $18.25; and Clyde, $19 to $19.50.

Tin—Jobbing lots of Banca are quoted at 22c.; Straits and Malacca, 22½c.; Billiton, 22c.

Copper—There has been a still further advance of prices in London, but the market here does not seem to be affected. Prices are the same as last week, viz.: 16.95c. to 17c. for spot.

Spelter—We quote ordinary brands of Western 4.75c. to 5c. Choice 5¼c.; Refined 6⅛c. to 7¼c., and Silesian 5½c. to 5⅝.

✻WANTED✻

"Situation and Help" Advertisements only inserted under this head. Rate 30 cents a line for each insertion. About seven words make a line. Copy should be sent to reach us not later than Wednesday morning for the ensuing week's issue.

Wanted—Men to examine S. S. planes; see p. 11.

Mech'l draftsman and designer, has had practical shop exp., wants position. Box 20, AM. MACHINIST.

Wanted—Good mechanical draftsman on sugar house work; references. L. M. Q., AM. MACHINIST.

Wanted—Travelers for New England and Middle States, to handle mechanical goods; liberal commission. Box 17, AMERICAN MACHINIST.

A young man wishes permanent employment as mech'l draftsman; is an experienced machinist, designer and draftsman; best ref. C. L., AM. MACHINIST.

Wanted—Brass pipe fitter on new locomotive work, and man for jackets; state experience and wages expected. Address BOX 19, AM. MACHINIST.

Wanted—Position as draftsman by young man 28, graduate of technical school; six years' shop experience on various classes of work, and six years' as draftsman on tools and general machinery. Address G. N., AMERICAN MACHINIST.

A1 draftsman and designer, capable of superintending works, desires engagement; has had 15 years' practical experience in designing and inventing special and labor-saving machinery; 8 years with last employers; excellent references. A. C. Campbell, care AMERICAN MACHINIST.

Wanted—A good workman with knowledge of Spanish, competent to erect machinery and steam power and lay out and attend to the necessary masonry in connection with the same; state reference and wages expected. Address F. M., AMERICAN MACHINIST.

Wanted—An experienced bookkeeper and accountant for a foundry and machine shop, near Baltimore, Md.; young man preferred, and must understand the supply business as well as the foundry and mach. business. Address stating age, exp., refs. and salary expected, Bookkeeper, AM. MACHINIST.

Wanted foundry foreman. A thoroughly reliable man who is capable of producing first-class work at minimum cost, in pulley and machine castings, heavy and light, can find steady employment at the highest wages with us; must produce proper and reliable recommendations, which will be thoroughly investigated. Todd Pulley & Shafting Works, East St. Louis, Ill.

Wanted—An experienced foundryman as assistant to superintendent of large foundry in the West, making heavy machinery castings in connection with a large manufacturing establishment; must have full knowledge of mixing various irons and moulding of heavy general castings. Applicant should give references and general history of applicant's experience. Address Box 21, AM. MACHINIST.

✢ MISCELLANEOUS WANTS. ✢

Advertisements will be inserted under this head at 35 cents per line, each insertion.

Crescent solid lubricant, clean, durable, cheap; prevents hot boxes. Crescent Mfg. Co., Cleveland.

The Crescent automatic grease cup is adapted to every service. Crescent Mfg. Co., Cleveland, Ohio.

Wanted—A small second-hand foot-power lathe. Box 184, National City, Cal.

August C. Christensen, 24 State st., N. Y., mechanical engineer and draftsman; 25 years' experience.

Light and fine machinery to order; Foot Lathe Catalogue for stamp. E. O. Chase, Newark, N. J.

D. J. Kelsey, M. E., designs machinery and iron structures; pat. drawings. 31 Ins. Bld., New Haven, Ct.

For Sale—One each, 1½", 2½" Merriman bolt cutters, new and complete. The McLagon Foundry Co., New Haven, Ct.

Correspondence solicited with parties having machine or foundry specialties to build. Honesdale Iron Works, Honesdale, Pa.

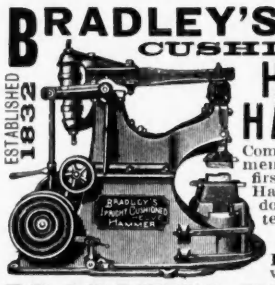
Wanted.—To buy second-hand lathes, planers and shapers of all sizes; must be cheap and in good order. Fosdick & Plucker, 6th and Culvert Streets, Cincinnati O.

How to remove and prevent scale in steam boilers at a cost of ten cents a week. Send postal for circular to Pittsburgh Boiler Scale Resolvent Co., Pittsburgh, Pa.

Hardware, light machinery and models in brass, iron or steel made to order in small or large quantities. Catalogue of model supplies and tools free. Goodnow & Wightman, Boston, Mass.

For Sale—One second-hand Daniels wood surface planer, all in good order and nearly new, 34 inch wide between uprights, 12 feet table, with 6 feet extension. The R. A. Belden Co., New Haven, Conn.

Ernest W. Naylor, consulting engineer, 149 Broadway, N. Y. Designer of the heaviest class of machinery used in the manufacture of iron and steel; hydraulic forging presses, etc.; armor plate presses, cranes and hoists of every description, and up to any size.



BRADLEY'S UPRIGHT CUSHIONED HELVE HAMMER

ESTABLISHED 1832

Combines the best elements essential in a first-class **Hammer.** Has more good points, does more and better work and costs less for repairs than any other **Hammer** in the world.

BRADLEY'S HEATING FORGES.

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With a manufacturing experience of over half a century, we recommend these machines to be the best, simplest, most durable and combining all the essential elements. **For hard coal or coke.** Indispensable in all shops to keep **Bradley's Cushioned Hammers** and men fully employed and reduces cost of production.

Pat. Aug. 30, 1887.

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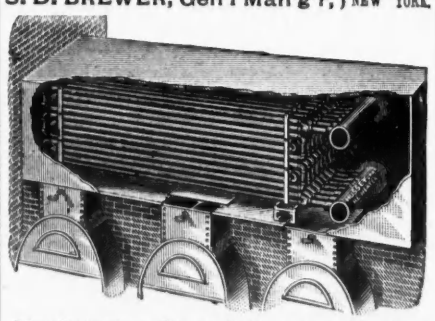
THE HUSSEY RE-HEATER and STEAM PLANT IMPROVEMENT CO.

A. S. HATCH, President, } 15 Cortlandt Street, NEW YORK.
S. D. BREWER, Gen'l Man'g'r, }



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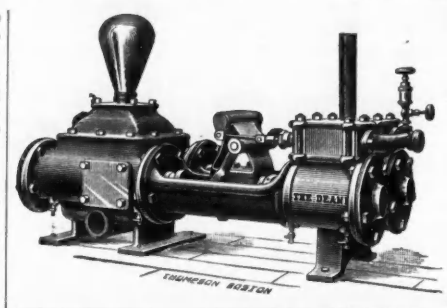
The Fishkill Landing Machine Co., located at **Fishkill, on the Hudson, N. Y.,** offer to manufacturers and others desiring a well built, economical and durable engine, their improved **CORLISS ENGINES.** They are endorsed by many reputable engineers and persons using them. Address as above.

GEO. F. BLAKE MANF'G CO

BUILDERS OF EVERY VARIETY OF

95 & 97 LIBERTY ST., NEW YORK. 111 FEDERAL ST., BOSTON.

WATER WORKS PUMPING ENGINES A SPECIALTY



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PUMPS

FOR ALL PURPOSES.

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THE HENDEY 18-INCH ENGINE LATHE

Combines modern design with superior workmanship at a moderate price. No extra charge for Compound Rest, Hollow Spindle or Power Cross Feed. Length of beds, 6, 8, 10, 12, 14 and 16 feet. Have other sizes of Lathes; also, Shapers, Planers, &c. Send for Catalogue and Prices.

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THAT WILL DO MORE WORK THAN ANY YOU HAVE USED.

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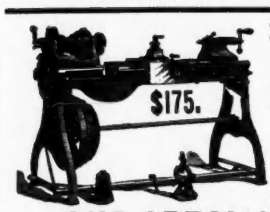

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OUR SPECIALTIES, 8, 12, 14 and 18 inch Lathes.

STEPHENS' PATENT VISES.

QUICK-ADJUSTING CAM AND TOGGLE JOINT.

Stationary or Patent Swivel Bases.

INCOMPARABLE FOR STRENGTH, DURABILITY, FIRM HOLD AND QUICK WORK.

Has improved Taper, Pipe and other attachments. Made in 2, 2¾, 3½, 4½, 5½, and 6½ inch width of jaw. Sold by the Trade. Send for Circular.

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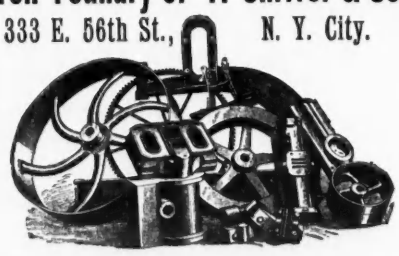
Iron Foundry of T. Shriver & Co.,

333 E. 56th St., N. Y. City.



Nice Castings, Smooth and True to Patterns, of very best brands of Pig Iron.

CASTINGS IN QUANTITY AT FAVORABLE PRICES.

Adjustable Clamping Blocks.

A simple device used to fill under clamps, when clamping work to various machines. Does away with lumber yards, scrap piles and confusion about your shops. Send for descriptive circulars and prices.

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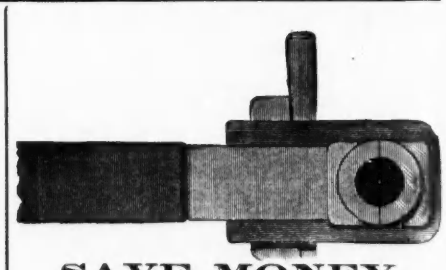

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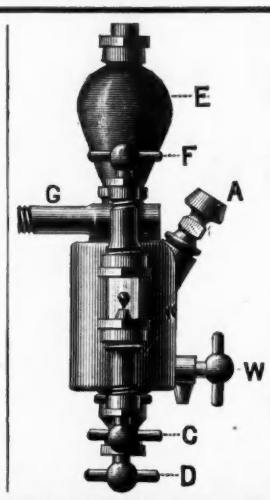

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Nos.....	1	2	3
Price.....	$10.00	$12.00	$15.00
Capacity....	½ pt.	½ pt.	¾ pt.

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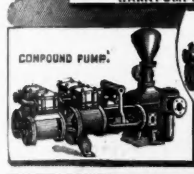

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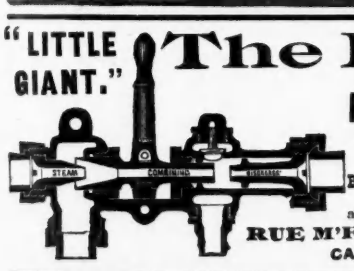

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Boiler Washer and Testing Device.

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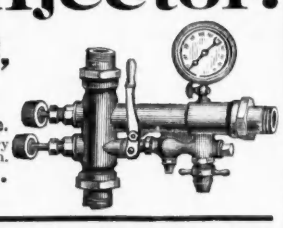

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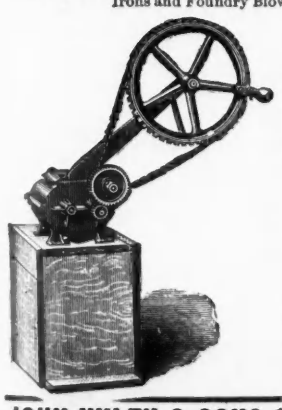

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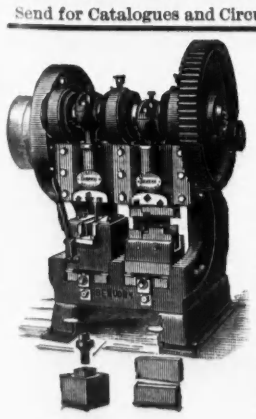

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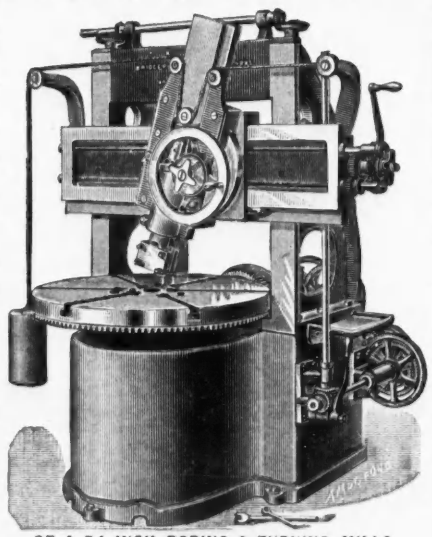

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No.	INCH.	PRICE.	No.	INCH.	PRICE.
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3	¾	.50	9	2½	1.40
4	1	.60	10	3	1.50
5	1¼	.75	11	3½	1.70
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7	1¾	1.00	Full Set of 12		12.00

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WARRANTED THE **BEST PUMP** MADE FOR ALL SITUATIONS.

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Boiler Feeders, Duplex Pumps,
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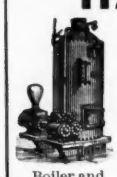

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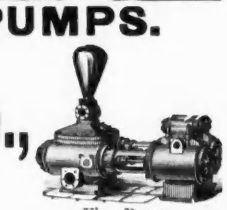

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More Efficient, Simple, Durable, and more Economical, both as to running expenses and repairs, than any other Steam Pump.

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FITCHBURG MACHINE WORKS,

Manufacturers of

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OFFICE AND WORKS

NOS. 13 to 21 MAIN STREET,
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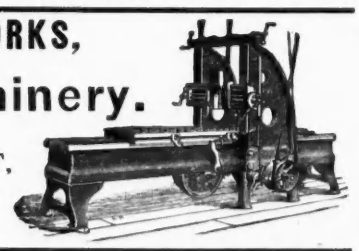

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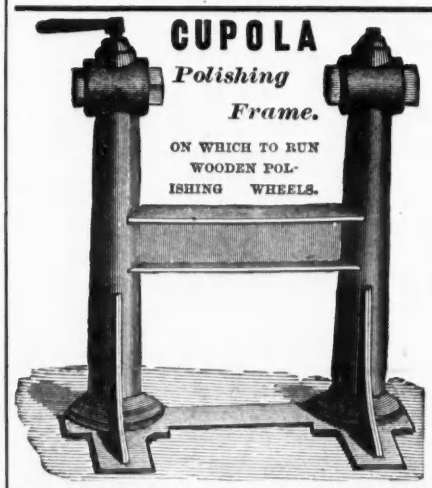

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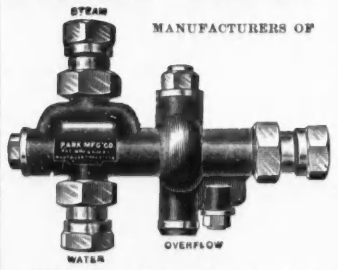

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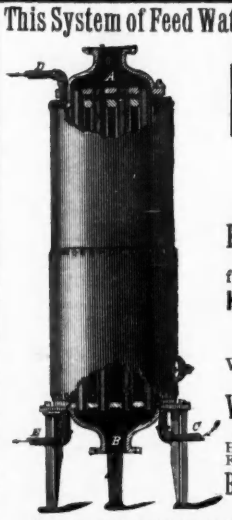

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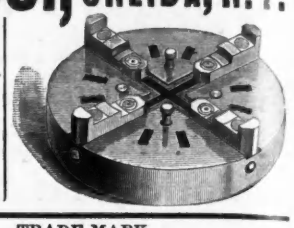

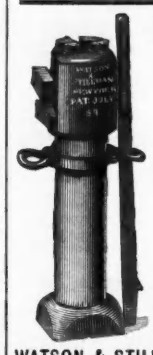

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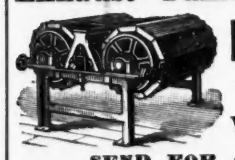

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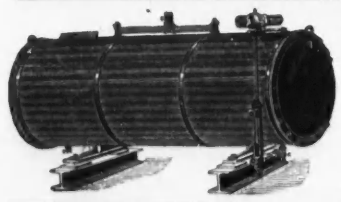

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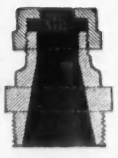

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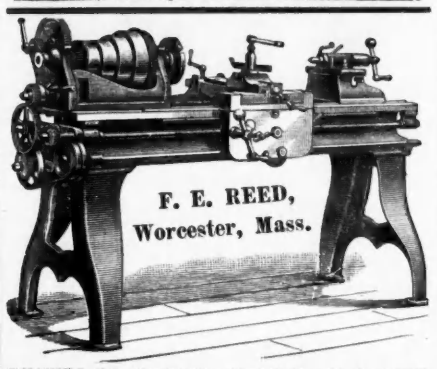

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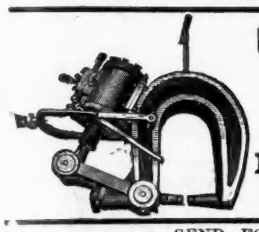

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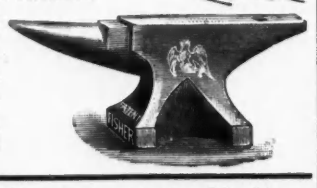

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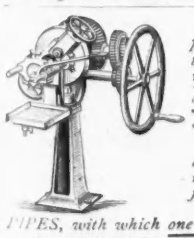

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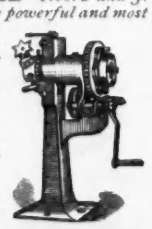

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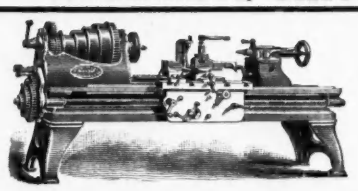

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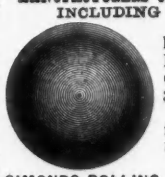

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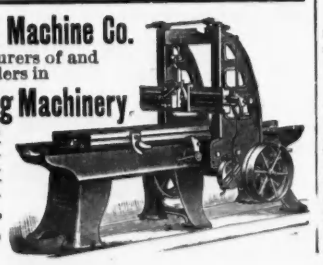

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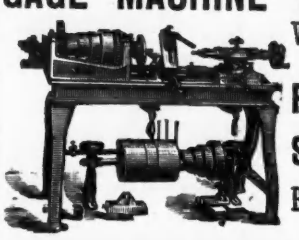

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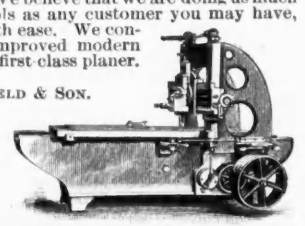

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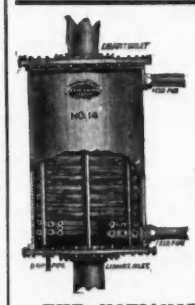

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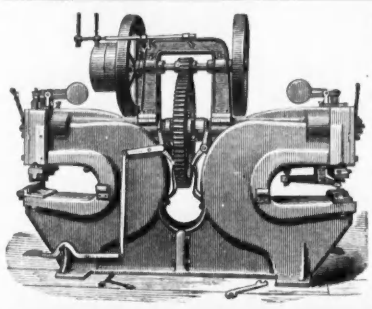

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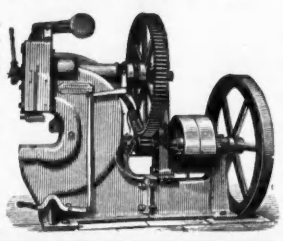

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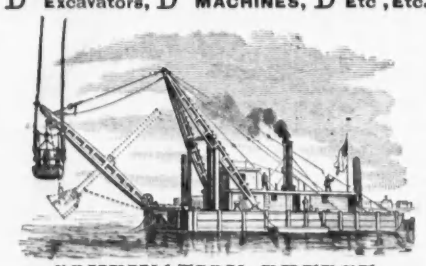

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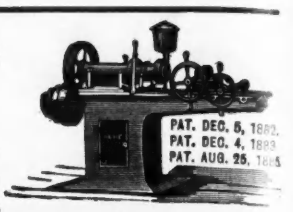

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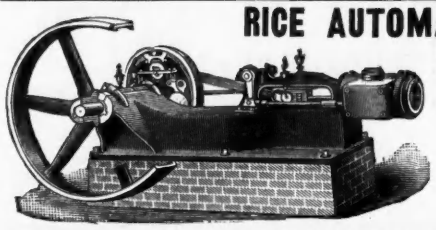

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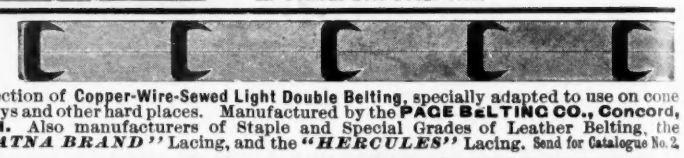

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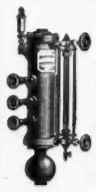

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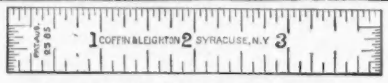

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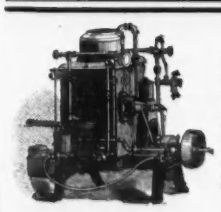

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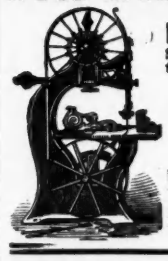

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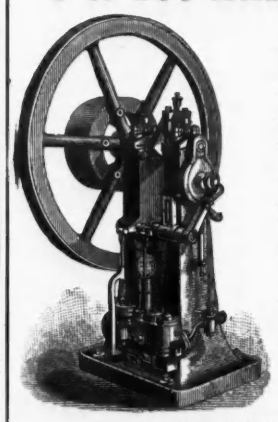

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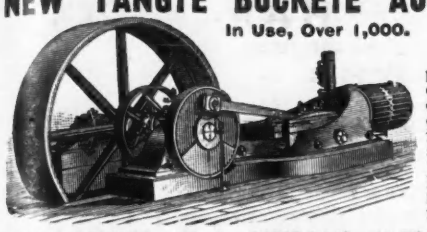

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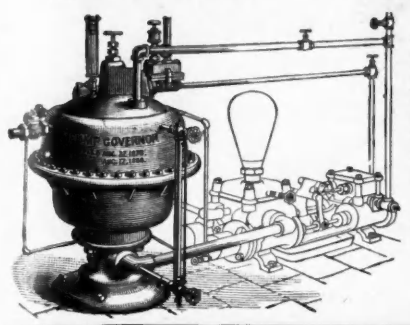

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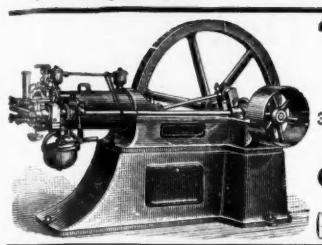

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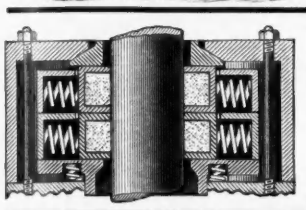

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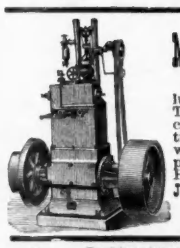

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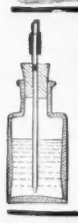

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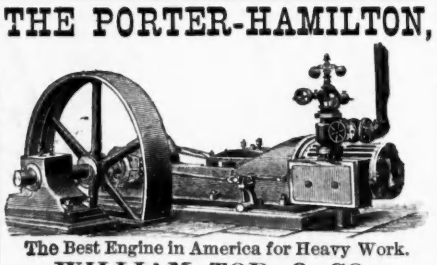

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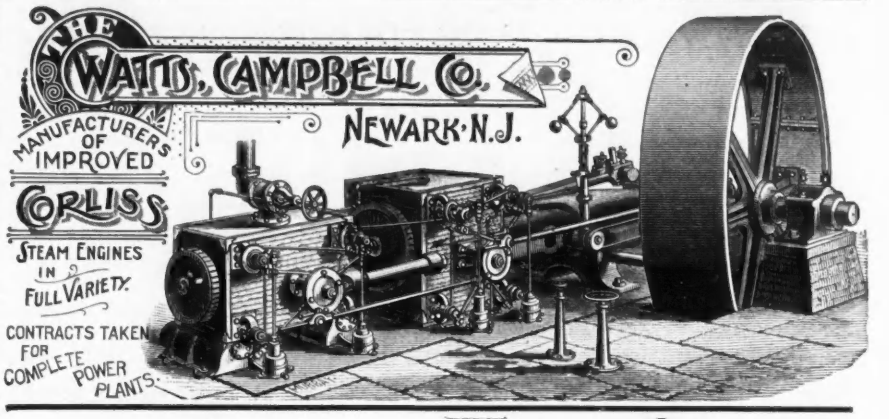

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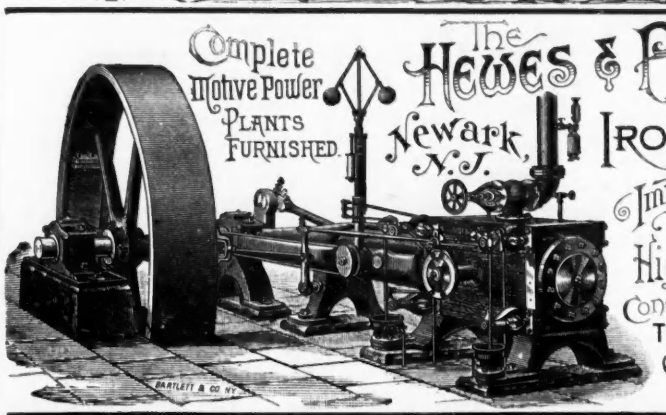

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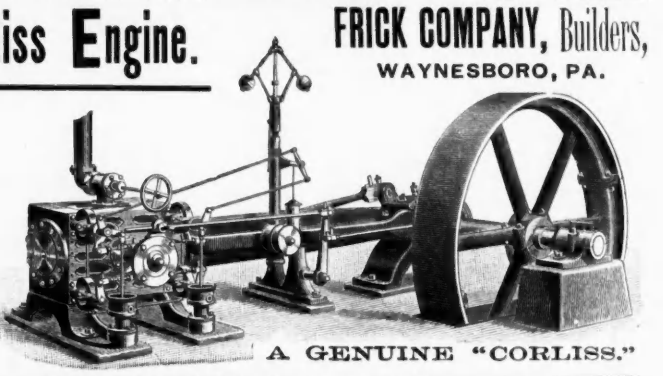

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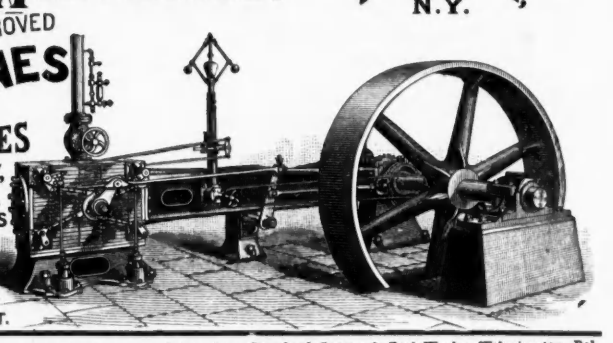

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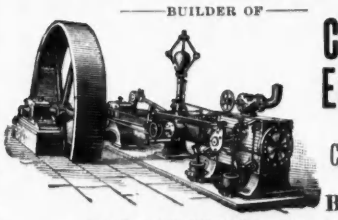

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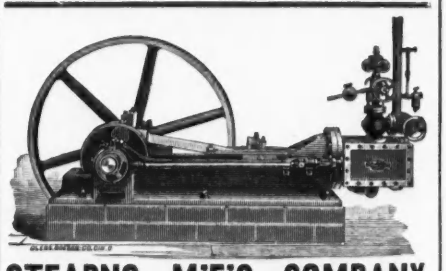

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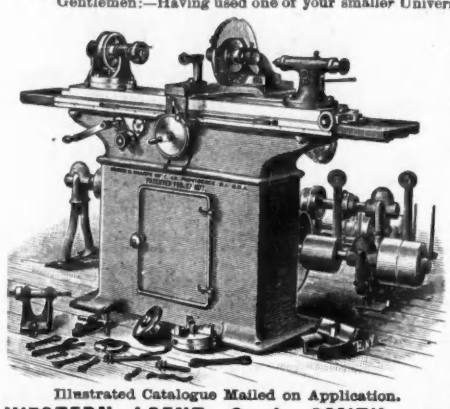

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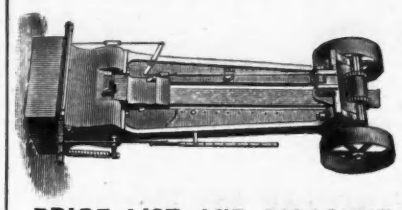

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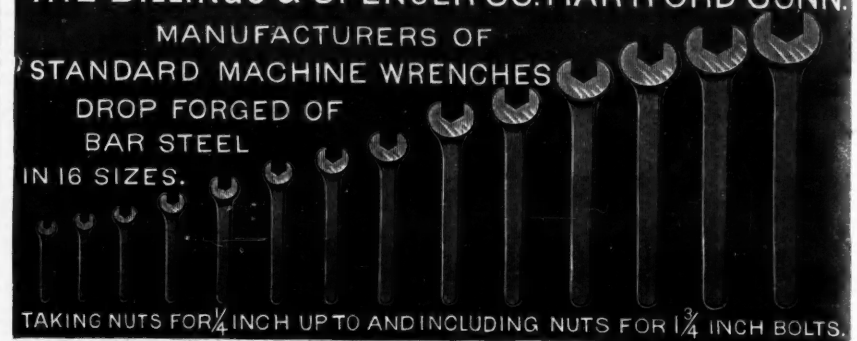

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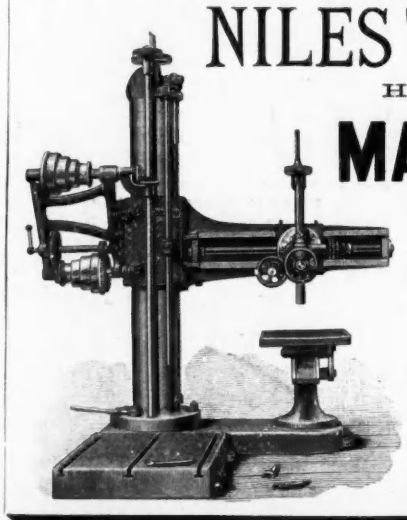

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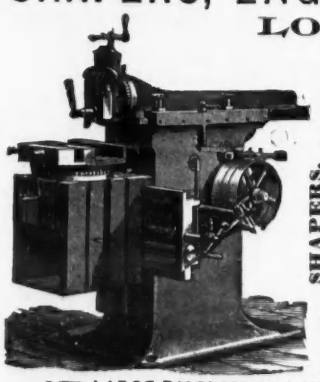

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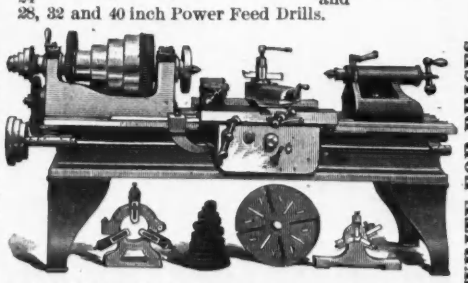

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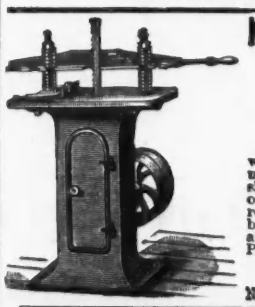

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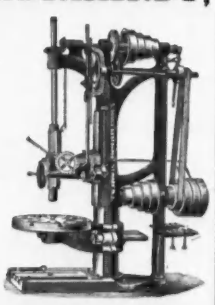

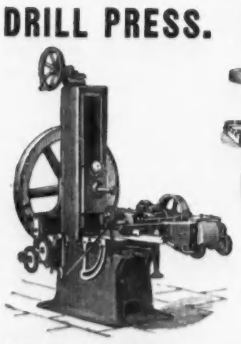

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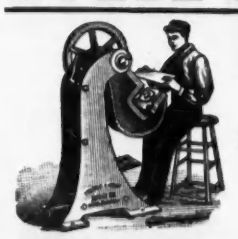

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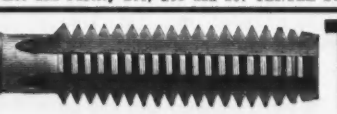

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